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Sir:

Transmitted herewith for filing is the patent application of

Inventor(s): IMMINK, Kees A. S.

For: METHOD AND APPARATUS FOR CODING INFORMATION, METHOD AND APPARATUS FOR DECODING INFORMATION, METHOD OF FABRICATING A RECORDING MEDIUM, THE RECORDING MEDIUM AND MODULATED SIGNAL

Enclosed are:

_X_ A specification consisting of 30 pages

_X_ 24 sheet(s) of Formal drawings

_X_ An assignment of the invention

___ Certified copy of Priority Document(s)

_X_ Executed Declaration ___ Original _X_ Photocopy

___ A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27

___ Preliminary Amendment

___ Information Disclosure Statement, PTO-1449 and reference(s)

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MULTIPLE DEPENDENT CLAIM PRESENTED	no		+270 = $	0.00	or	+135 = $	0.00
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Respectfully submitted,

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METHOD AND APPARATUS FOR CODING INFORMATION, METHOD AND APPARATUS FOR DECODING CODED INFORMATION, METHOD OF FABRICATING A RECORDING MEDIUM, THE RECORDING MEDIUM AND MODULATED SIGNAL

FIELD OF THE INVENTION

The present invention relates to coding information, and more particularly, to a method and apparatus for coding information having improved information density. The present invention further relates to producing a modulated signal from the coded information, producing a recording medium from the coded information, and the recording medium itself. The present invention still further relates to a method and apparatus for decoding coded information, and decoding coded information from a modulated signal and/or a recording medium.

BACKGROUND OF THE INVENTION

When data is transmitted through a transmission line or recorded onto a recording medium such as a magnetic disc, an optical disc or a magneto-optical disc, the data is modulated into code matching the transmission line or the recording medium prior to the transmission or recording.

Run length limited codes, generically designated as (d, k) codes, have been widely and successfully applied in modern magnetic and optical recording systems. Such codes, and means for implementing such codes are described by K. A. Schouhamer Immink in the book entitled "Codes for Mass Data Storage Systems" (ISBN 90-74249-23-X , 1999). Run length limited codes are extensions of earlier non return to zero recording codes, where binary recorded "zeros" are represented by no (magnetic flux) change in the recording medium, while binary "ones" are represented by transitions from one direction of recorded flux to the opposite direction.

In a (d, k) code, the above recording rules are maintained with the additional constraints that at least d "zeros" are recorded between successive "ones", and no more than k "zeros" are recorded between successive "ones". The

first constraint arises to obviate intersymbol interference occurring because of pulse crowding of the reproduced transitions when a series of "ones" are contiguously recorded. The second constraint arises to ensure recovering a clock from the reproduced data by "locking" a phase locked loop to the reproduced transitions. If there is too long an unbroken string of contiguous "zeros" with no interspersed "ones", the clock regenerating phase-locked-loop will fall out of synchronism. In, for example, a (1,7) code there is at least one "zero" between recorded "ones", and there are no more than seven recorded contiguous "zeros" between recorded "ones".

The series of encoded bits is converted, via a modulo-2 integration operation, to a corresponding modulated signal formed by bit cells having a high or low signal value. A "one" bit is represented in the modulated signal by a change from a high to a low signal value or vice versa, and a "zero" bit is represented by the lack of change in the modulated signal.

The information conveying efficiency of such codes is typically expressed as a rate, which is the quotient of the number of bits (m) in the information word to the number of bits (n) in the code word (i.e., m/n). The theoretical maximum rate of a code, given values of d and k, is called the Shannon capacity. FIGURE 1 tabulates the Shannon capacity C(d,k) for d=1 versus k. As shown, for a (1,7) code, the Shannon capacity, C(1,7), has a value of 0.67929. This means that a (1,7) code cannot have a rate larger than 0.67929. The practical implementation of codes requires that the rate be a rational fraction, and to date the above (1,7) code has a rate 2/3. This rate of 2/3 is slightly less than the Shannon capacity of 0.67929, and the code is therefore a highly efficient one. To achieve the 2/3 rate, 2 unconstrained data bits are mapped into 3 constrained encoded bits.

(1,7) codes having a rate of 2/3 and means for implementing associated encoders and decoders are known in the art. U.S. Patent No. 4,413,251 entitled "Method and Apparatus for Generating A Noiseless Sliding Block Code for a (1,7) Channel with Rate 2/3", issued in the names of Adler et al., discloses an encoder which is a finite-state machine having 5 internal states. U.S. Patent No. 4,488,142

entitled "Apparatus for Encoding Unconstrained Data onto a (1,7) Format with Rate 2/3", issued in the name of Franaszek discloses an encoder having 8 internal states.

However, a demand exists for even more efficient codes so that, for example, the information density on a recording medium or over a transmission line can be increased.

SUMMARY OF THE INVENTION

In the converting method and apparatus according to the present invention, m-bit information words are converted into n-bit code words at a rate greater than 2/3. Consequently, the same amount of information can be recorded in less space, and information density increased.

In the present invention, n-bit code words are divided into a first type and a second type, and into coding states of a first kind and a second kind such that an m-bit information word is converted into an n-bit code word of the first or second kind if the previous m-bit information word was converted into an n-bit code word of the first type and is converted into an n-bit code word of the first kind if the previous m-bit information word was converted into an n-bit code word of the second type. In one embodiment, n-bit code words of the first type end in zero, n-bit code words of the second type end in one, n-bit code words of the first kind start with zero, and n-bit code words of the second kind start with zero or one. Furthermore, in the embodiments according to the present invention, the n-bit code words satisfy a dk-constraint of (1,k) such that a minimum of 1 zero and a maximum of k zeros falls between consecutive ones.

In other embodiments of the present invention, the coding device and method according to the present invention are employed to record information on a recording medium and create a recording medium according to the present invention.

In still other embodiments of the present invention, the coding device and method according to the present invention are further employed to transmit information.

In the decoding method and apparatus according to the present invention, n-bit code words created according to the coding method and apparatus are decoded into m-bit information words. The decoding involves determining the state of a next n-bit code word, and based on the state determination, the current n-bit code word is converted into an m-bit information word.

In other embodiments of the present invention, the decoding device and method according to the present invention are employed to reproduce information from a recording medium.

In still other embodiments of the present invention, the decoding device and method according to the present invention are employed to receive information transmitted over a medium.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, wherein like reference numerals designate corresponding parts in the various drawings, and wherein:

FIGURE 1 tabulates the Shannon capacity C(d,k) for d=1 versus k;

FIGURE 2 shows an example of how the code words in the various subgroups are allocated in to the various states in the first embodiment;

FIGURE 3 shows an embodiment for a coding device according to the invention;

FIGURES 4A-4H show a complete translation table according to the first embodiment for converting 9-bit information words into 13-bit code words;

FIGURE 5 illustrates the conversion of a series of information words into a series of code words using the translation table of FIGURES 4A-4H;

FIGURE 6 illustrates an embodiment of a recording device according to the present invention;

FIGURE 7 illustrates a recording medium and modulated signal according to the present invention;

FIGURE 8 illustrates a transmission device according to the present invention;

FIGURE 9 illustrates a decoding device according to the present invention;

FIGURE 10 illustrates a reproducing device according to the present invention;

FIGURE 11 illustrates a receiving device according to the present invention;

FIGURE 12 shows an example of how the code words in the various subgroups are allocated in to the various states in the second embodiment;

FIGURES 13A-13C show the beginning, middle and end portions of a translation table according to the second embodiment for converting 9-bit information words into 13-bit code words

FIGURE 14 shows an example of how the code words in the various subgroups are allocated in to the various states in the third embodiment;

FIGURES 15A-15C show the beginning, middle and end portions of a translation table according to the third embodiment for converting 11-bit information words into 16-bit code words

FIGURE 16 shows an example of how the code words in the various subgroups are allocated in to the various states in the fourth embodiment; and

FIGURES 17A-17C show the beginning, middle and end portions of a translation table according to the fourth embodiment for converting 13-bit information words into 19-bit code words.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The general coding method according to the present invention will be described followed by a specific first embodiment of the coding method. Next, the

general decoding method according to the present invention will be described in the context of the first embodiment. The various apparatuses according to the present invention will then be described. Specifically, the coding device, recording device, transmission device, decoding device, reproducing device and receiving device according to the present invention will be described. Afterwards, additional coding embodiments according to the present invention will be described.

CODING METHOD

According to the present invention, an m-bit information word is converted into an n-bit code word such that the rate of m/n is greater than 2/3. The code words are divided into first and second types wherein the first type includes code words ending with "0" and the second type includes code words ending with "1." As a result, the code words of the first type are divided into two subgroups E00 and E10, and code words of the second type are divided into two subgroups E01 and E11. Code word subgroup E00 includes code words that start with "0" and end with "0", code word subgroup E01 includes code words that start with "0" and end with "1", code word subgroup E10 includes code words that start with "1" and end with "0", and code word subgroup E11 includes code words that start with "1" and end with "1".

The code words are also divided into at least one state of a first kind and at least one state of a second kind. States of the first kind include code words that only start with "0," and states of the second kind include code words that start with either "0" or "1."

CODING METHOD ACCORDING TO A FIRST EMBODIMENT

In a first preferred embodiment of the present invention, 9-bit information words are converted into 13-bit code words. The code words satisfy a (d,k) constraint of (1,k), and are divided into 3 states of the first kind and 2 states of the second kind (a total of 5 states). In order to reduce the k-constraint, three code words, namely, "0000000000000", "0000000000001", and "0000000000010" are

barred from the encoding tables. An enumeration of code words shows there are 231 code words in subgroup E00, 144 code words in subgroup E10, 143 code words in subgroup E01, and 89 code words in subgroup E11.

To perform encoding, each 13-bit code word in each state is associated with a coding state direction. The state direction indicates the next state from which to select a code word in the encoding process. The state directions are assigned to code words such that code words that end with a "0" (i.e. code words in subgroups E10 and E00) have associated state directions that indicate any of the r=5 states, while code words that end with a "1" (i.e., code words in subgroups E01 and E11) have associated state directions that only indicate one of the states of the first kind. This ensures that the d=1 constraint will be satisfied; namely, after a code word ending in "1", the next code word will start with "0".

Furthermore, while, as explained in more detail below, the same code word can be assigned to different information words in the same state, different states cannot include the same code word. In particular code words in subgroups E10 and E00 can be assigned 5 times to different information words within one state, while code words in subgroups E11 and E01 can be assigned 3 times to different information words within one state. As there are 231 code words in subgroup E00 and 144 code words in subgroup E10, there are 1875 (5*(231+144)) "code word – state direction" combinations for code words of the first type. There are 143 code words in subgroup E01 and 89 code words in E11, so that there are 696 (3*(143+89)) "code word – state direction" combinations for code words of the second type. In total 1875+696=2571 "code word - state direction" combinations exist.

For m-bit information words, there are a total of 2^m possible information words. So, for 9-bit information words, 2^9 = 512 information words exist. Because there are five states in this encoding embodiment, 5 times 512 = 2561 of the "code word - state direction" combinations are needed. This leaves 2571-2561 = 10 remaining combinations.

The available code words in the various subgroups are distributed over the states of the first and second kind in compliance with the restrictions discussed above. FIGURE 2 shows an example of how the code words in the various subgroups are allocated in this embodiment to the various states. As shown in FIGURE 2, in this example, states 1, 2, and 3 are states of the first kind and states 4 and 5 are states of the second kind. Taking the subgroup E00 of size 230 as an example, subgroup E00 has 76 code words in each of states 1, 2, and 3 plus 1 code word in each of states 4 and 5. And, taking state 1 as an example, in state 1 the number of "code word – state direction" combinations is 5x76+3x44=512, which means that 9-bit information words can be assigned. Remember, each code word of the first type can be assigned any one of the five different states as a state directions, and therefore used five time within a state; while each code word of the second type can only be assigned one of the three states of the first kind as a state direction because of the d=1 restriction, and therefore used three times within a state.

It can be verified that from any of the r=5 coding states shown in FIGURE 2 there at least 512 information words that can be assigned to code words, which is enough to accommodate 9-bit information words. In the manner described above any random series of 9-bit information words can be uniquely converted to a series of code words.

FIGURES 4A-4H show a complete translation table according to this embodiment for converting 9-bit information words into 13-bit code words. Included in the translation table of FIGURES 4A-4H are the state direction assigned to each code word. Specifically, in FIGURES 4A-4H, the first column shows the decimal notation of the information words in the second column. The third, fifth, seventh, ninth and eleventh columns show the code words (also referred to in the art as channel bits) assigned to the information words in states 1, 2, 3, 4 and 5, respectively. The fourth, sixth, eighth, tenth and twelfth columns show by way of the respective digits 1, 2, 3, 4 and 5 the state direction of the

associated code words in the third, fifth, seventh, ninth and eleventh columns, respectively.

The conversion of a series of information words into a series of code words will be further explained with reference to FIGURE 5. The first column of FIGURE 5 shows from top to bottom a series of successive 9-bit information words, and the second column shows in parenthesis the decimal values of these information words. The third column "state" is the coding state that is to be used for the conversion of the information word. The "state" is laid down when the preceding code word was delivered (i.e., the state direction of the preceding code word). The fourth column "code words" includes the code words assigned to the information words according to the translation table of FIGURES 4A-H. The fifth column "next state" is the state direction associated with the code word in the fourth column and is also determined according to the translation table of FIGURES 4A-H.

The first word from the series of information words shown in the first column of FIGURE 5 has a word value of "1" in decimal notation. Let us assume that the coding state is state 1 (S1) when the conversion of the series of information words is initiated. Therefore the first word is translated into code word "0000000000100" according to the state 1 set of code words from the translation table. At the same time the next state becomes state 2 (S2) because the state direction assigned to code word "0000000000100" representing decimal value 1 in state 1 is state 2. This means that the next information word (decimal value "3") is going to be translated using the code words in state 2. Consequently, the next information word, having a decimal value of "3", is translated into code word "0001010001010". Similar to the manner described above, the information words having the decimal values "5", "12" and "19" are converted.

DECODING METHOD

Hereinafter, decoding of n-bit code words (in this example 13-bit words) received from a recording medium will be further explained with reference to

FIGURES 4A-4H. For the purposes of description, assume that the word values of a series of successive code words received from, for example, a recording medium are "0000000000100", "0001010001010", "0101001001001". From the translation table of FIGURES 4A-4H, it is found that the first code word "0000000000100" is assigned to the information words "0", "1", "2", "3" and "4" and state directions 1, 2, 3, 4 and 5, respectively. The next code word value is "0001010001010", and belongs to the set of code words in state 2. This means that the first code word "0000000000100" had a state direction of 2. The first code word "0000000000100" with a state direction of 2 represents the information word having a decimal value of "1". Therefore, it is determined that the first code word represents information word "000000001" having a decimal value of "1".

Furthermore, the third code word "0101001001001" is a member of state 4. Therefore, it is determined in the same manner as above that the second code word "0001010001010" represents the information word having the decimal value "3". In the same manner other code words can be decoded. It is noted that both the current code word and the next code words are observed to decode the current code word into a unique information word.

CODING DEVICE

FIGURE 3 shows an embodiment for a coding device 124 according to the invention. The coding device 124 converts m-bit information words into n-bit code words, where the number of different coding states r is represented by s bits. For example, when the number of coding states r = 5, s equals 3. As shown, the coding device 124 includes a converter 50 for converting (m+s) binary input signals to (n+s) binary output signals. In a preferred embodiment, the converter 50 includes a read only memory (ROM) storing a translation table according to at least one embodiment of the present invention and address circuitry for addressing the translation table based on the m+s binary input signals. However, instead of a ROM, the converter 50 can include a combinatorial logic circuit

producing the same results as the translation table according to at least one embodiment of the present invention.

From the inputs of the converter 50, m inputs are connected to a first bus 51 for receiving m-bit information words. From the outputs of the converter 50, n outputs are connected to a second bus 52 for delivering n-bit code words. Furthermore, s inputs are connected to an s-bit third bus 53 for receiving a state word that indicates the instantaneous coding state. The state word is delivered by a buffer memory 54 including, for example, s flip-flops. The buffer memory 54 has s inputs connected to a fourth bus 55 for receiving a state direction to be loaded into the buffer memory 54 as the state word. For delivering the state directions to be loaded in the buffer memory 54, the s outputs of the converter 50 are used.

The second bus 52 is connected to the parallel inputs of a parallel-to-serial converter 56, which converts the code words received over the second bus 52 to a serial bit string. A signal line 57 supplies the serial bit string to a modulator circuit 58, which converts the bit string into a modulated signal. The modulated signal is then delivered over a line 60. The modulator circuit 58 is any well-known circuit for converting binary data into a modulated signal such as a modula-2 integrator.

For the purposes of synchronizing the operation of the coding device, the coding device includes a clock generating circuit (not shown) of a customary type for generating clock signals for controlling timing of, for example, the parallel/serial converter 58 and the loading of the buffer memory 54.

In operation, the converter 50 receives m-bit information words and an s-bit state word from the first bus 51 and the third bus 53, respectively. The s-bit state word indicates the state in the translation table to use in converting the m-bit information word. Accordingly, based on the value of the m-bit information word, the n-bit code word is determined from the code words in the state identified by the s-bit state word. Also, the state direction associated with the n-bit code word is determined. The state direction, namely, the value thereof is converted into an s-bit binary word; or alternatively, the state directions are stored in the translation

table as s-bit binary words. The converter 50 outputs the n-bit code word on the second bus 52, and outputs the s-bit state direction on fourth bus 55. The buffer memory 54 stores the s-bit state direction as a state word, and supplies the s-bit state word to the converter 50 over the third bus 53 in synchronization with the receipt of the next m-bit information word by the converter 50. This synchronization is produced based on the clock signals discussed above in any well-known manner.

The n-bit code words on the second bus 52 are converted to serial data by the parallel/serial converter 56, and then the serial data is converted into a modulated signal by the modulator 58.

The modulated signal may then undergo further processing for recordation or transmission.

RECORDING DEVICE

FIGURE 6 shows a recording device for recording information that includes the coding device 124 according to the present invention as shown in FIGURE 3. As shown in FIGURE 6, m-bit information is converted into a modulated signal through the coding device 124. The modulated signal produced by the coding device 124 is delivered to a control circuit 123. The control circuit 123 may be any conventional control circuit for controlling an optical pick-up or laser diode 122 in response to the modulated signal applied to the control circuit 123 so that a pattern of marks corresponding to the modulated signal are recorded on the recording medium 110.

FIGURE 7 shows by way of example, a recording medium 110 according to the invention. The recording medium 110 shown is a read-only memory (ROM) type optical disc. However, the recording medium 110 of the present invention is not limited to a ROM type optical disk, but could be any type of optical disk such as a write-once read-many (WORM) optical disk, random accessible memory (RAM) optical disk, etc. Further, the recording medium 110 is not limited to being

an optical disk, but could be any type of recording medium such as a magnetic disk, a magneto-optical disk, a memory card, magnetic tape, etc.

As shown in FIGURE 7, the recording medium 110 according to one embodiment of the present invention includes information patterns arranged in tracks 111 . Specifically, FIGURE 7 shows an enlarged view of a track 111 along a direction 114 of the track 111. As shown, the track 111 includes pit regions 112 and non-pit regions 113. Generally, the pit and non-pit regions 112 and 113 represent constant signal regions of the modulated signal 115 (zeros in the code words) and the transitions between pit and non-pit regions represent logic state transitions in the modulated signal 115 (ones in the code words).

As discussed above, the recording medium 110 may be obtained by first generating the modulated signal and then recording the modulated signal on the recording medium 110. Alternatively, if the recording medium is an optical disc, the recording medium 110 can also be obtained with well-known mastering and replica techniques.

TRANSMISSION DEVICE

FIGURE 8 shows a transmission device for transmitting information that includes the coding device 124 according to the present invention as shown in FIGURE 3. As shown in FIGURE 8, m-bit information words are converted into a modulated signal through the coding device 124. A transmitter 150 then further processes the modulated signal, to convert the modulated signal into a form for transmission depending on the communication system to which the transmitter belongs, and transmits the converted modulated signal over a transmission medium such as air (or space), optical fiber, cable, a conductor, etc.

DECODING DEVICE

FIGURE 9 illustrates a decoder according to the present invention. The decoder performs the reverse process of the converter of FIGURE 3 and converts n-bit code words of the present invention into m-bit information words. As shown,

the decoder 100 includes a first look-up table (LUT) 102 and a second LUT 104. The first and second LUTs 102 and 104 store the translation table used to create the n-bit code words being decoded. Where K refers to time, the first LUT 102 receives the (K+1)th n-bit code word and the second LUT 104 receives the output of the first LUT 102 and the Kth n-bit code word. Accordingly, the decoder 100 operates as a sliding block decoder. At every block time instant the decoder 100 decodes one n-bit code word into one m-bit information word and proceeds with the next n-bit code word in the serial data (also referred to as the channel bit stream).

In operation, the first LUT 102 determines the state of the (K+1)th code word from the stored translation table, and outputs the state to the second LUT 104. So the output of the first LUT 102 is a binary number in the range of 1, 2,..., r (where r denotes the number of states in the translation table). The second LUT 104 determines the possible m-bit information words associated with Kth code word from the Kth code word using the stored translation table, and then determines the specific one of the possible m-bit information words being represented by the n-bit code word using the state information from the first LUT 102 and the stored translation table.

For the purposes of further explanation only, assume the n-bit code words are 13-bit code words produced using the translation table of FIGURES 4A-4H. Then, referring to FIGURE 5, if the (K+1)th 13-bit code word is "0001010001010" the first LUT 102 determines the state as state 2. Furthermore, if the Kth 13-bit code word is "0000000000100", then the second LUT 104 determines that the Kth 13-bit code word represents one of the 9-bit information words having a decimal value of 0, 1, 2, 3 or 4. And, because the next state or state direction of state 2 is supplied by the first LUT 102, the second LUT 104 determines that the Kth 13-bit code word represents the 9-bit information word having a decimal value of 1 because the 13-bit code word "0000000000100" associated with a state direction of 2 represents the 9-bit information word having a decimal value of 1.

REPRODUCING DEVICE

FIGURE 10 illustrates a reproducing device that includes the decoder 100 according to the present invention as shown in FIGURE 9. As shown, the reading device includes an optical pick-up 122 of a conventional type for reading a recording medium 110 according to the invention. The recording medium 110 may be any type of recording medium such as discussed previously. The optical pick-up 122 produces an analog read signal modulated according to the information pattern on the recording medium 110. A detection circuit 125 converts this read signal in conventional fashion into a binary signal of the form acceptable to the decoder 100. The decoder 100 decodes the binary signal to obtain the m-bit information words.

RECEIVING DEVICE

FIGURE 11 illustrates a receiving device that includes the decoder 100 according to the present invention as shown in FIGURE 9. As shown, the receiving device includes a receiver 160 for receiving a signal transmitted over a medium such as air (or space), optical fiber, cable, a conductor, etc. The receiver 160 converts the received signal into a binary signal of the form acceptable to the decoder 100. The decoder 100 decodes the binary signal to obtain the m-bit information words.

CODING METHOD ACCORDING TO A SECOND EMBODIMENT

FIGURES 12 and 13A-13C illustrate another embodiment of the present invention. According to this embodiment, the greater than 2/3 rate is achieved by converting 9-bit information words into 13-bit code words; wherein the number of coding states r equals 13, and 8 of the coding states are coding states of the first kind and 5 of the coding states are coding states of the second kind. Also, the code words satisfy a (d,k) constraint of (1,k). FIGURE 12 corresponds to FIGURE 2 of the first embodiment, and illustrates the division of code words among the states in this second embodiment.

As described above, code words that end with a “0”, i.e. code words in subgroups E00 and E10, are allowed to enter any of the r=13 states, while code words that end with a “1” i.e. code words in subgroups E01 and E11, may only enter the states of the first kind(State 1 to State 8).

Therefore, code words in subgroups E00 and E10 can be assigned 13 times to different information words, while code words in subgroups E01 and E11 can be assigned 8 times to different information words. Referring to FIGURE 12, subgroup E00 has 24 code words in state 1 and the subgroup E01 has 25 code words in state 1. So the number of “code words - state direction” combinations is (13x24)+(8x25)=512, which means that 9-bit information words can be assigned. It can be verified that from any of the r=13 coding states there at least 512 information words that can be assigned to code words, which is enough to accommodate 9-bit information words.

FIGURES 13A-13C illustrate the beginning, middle and end portions of the translation table for this second embodiment in the same fashion that FIGURES 4A-4H illustrated the translation table for the first embodiment.

CODING METHOD ACCORDING TO A THIRD EMBODIMENT

FIGURES 14 and 15A-15C illustrate another embodiment of the present invention. According to this embodiment, the greater than 2/3 rate is achieved by converting 11-bit information words into 16-bit code words; wherein the number of coding states r equals 13, and 8 of the coding states are coding states of the first kind and 5 of the coding states are coding states of the second kind. Also, the code words satisfy a (d,k) constraint of (1,k). FIGURE 14 corresponds to FIGURE 2 of the first embodiment, and illustrates the division of code words among the states in this third embodiment. It can be verified that from any of the r=13 coding states there at least 2048 information words that can be assigned to code words, which is enough to accommodate 11-bit information words.

FIGURES 15A-15C illustrate the beginning, middle and end portions of the translation table for the third embodiment in the same fashion that FIGURES 4A-4H illustrated the translation table for the first embodiment.

CODING METHOD ACCORDING TO A FOURTH EMBODIMENT

FIGURES 16 and 17A-17C illustrate another embodiment of the present invention. According to this embodiment, the greater than 2/3 rate is achieved by converting 13-bit information words into 19-bit code words; wherein the number of coding states r equals 5, and 3 of the coding states are coding states of the first kind and 2 of the coding states are coding states of the second kind. Also, the code words satisfy a (d,k) constraint of (1,k). FIGURE 16 corresponds to FIGURE 2 of the first embodiment, and illustrates the division of code words among the states in this fourth embodiment. It can be verified that from any of the r=5 coding states there at least 8192 information words that can be assigned to code words, which is enough to accommodate 13-bit information words.

FIGURES 17A-17C illustrate the beginning, middle and end portions the translation table for the fourth embodiment in the same fashion that FIGURES 4A-4H illustrated the translation table for the first embodiment.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

I Claim:

1. A method of converting, comprising:

receiving m-bit information words, where m is an integer;

converting the m-bit information words into n-bit code words, where n is an integer greater than m, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is converted into an n-bit code word of the first or second kind if the previous m-bit information word was converted into an n-bit code word of the first type and is converted into an n-bit code word of the first kind if the previous m-bit information word was converted into an n-bit code word of the second type.

2. The method of claim 1, wherein the converting step converts the m-bit information words into n-bit code words that satisfy a dk-constraint, where d indicates a minimum number of zeros between consecutive ones in the n-bit code words and k indicates a maximum number of zeros between consecutive ones in the n-bit code words.

3. The method of claim 2, wherein m/n is greater than 2/3, and d = 1.

4. The method of claim 2, wherein d = 1.

5. The method of claim 2, wherein the n-bit code words are divided into p coding states of the first kind and q coding states of the second kind, where p and q are integers greater than or equal to 1, and each of the p and q coding states have n-bit code words different from the n-bit code words in the other p and q coding states.

6. The method of claim 5, wherein m/n is greater than 2/3, d = 1, p = 3 and q = 2.

7. The method of claim 5, wherein p = 3 and q = 2.

8. The method of claim 5, wherein p+q equals 5.

9. The method of claim 5, wherein m/n is greater than 2/3, d = 1, p = 8 and q = 5.

10. The method of claim 5, wherein p = 8 and q = 5.

11. The method of claim 5, wherein p+q equals 13.

12. The method of claim 5, wherein at least one of the n-bit code words in one of the p coding states is associated with p+q of the m-bit information words.

13. The method of claim 12, wherein at least one of the n-bit code words in one of the q coding states is associated with p of the m-bit information words.

14. The method of claim 5, wherein at least one of the n-bit code words in one of the q coding states is associated with p of the m-bit information words.

15. The method of claim 1, wherein the n-bit code words are divided into p coding states of the first kind and q coding states of the second kind, where p and q are integers greater than or equal to 1, and each of the p and q coding states have n-bit code words different from the n-bit code words in the other p and q coding states.

16. The method of claim 15, wherein p+q equals 5.

17. The method of claim 15, wherein p+q equals 13.

18. The method of claim 15, wherein at least one of the n-bit code words in one of the p coding states is associated with p+q of the m-bit information words.

19. The method of claim 18, wherein at least one of the n-bit code words in one of the q coding states is associated with p of the m-bit information words.

20. The method of claim 15, wherein at least one of the n-bit code words in one of the q coding states is associated with p of the m-bit information words.

21. The method of claim 1, wherein the n-bit code words of the first type end in zero, the n-bit code words of the second type end in one, the n-bit code words in a coding state of the first kind start with zero, and the n-bit code words in a coding state of the second kind start with zero or one.

22. The method of claim 1, wherein the n-bit code words of the first type end in zero, and the n-bit code words of the second type end in one.

23.The method of claim 1, wherein the n-bit code words in a coding state of the first kind start with zero, and the n-bit code words in a coding state of the second kind start with zero or one.

24. The method of claim 1, wherein the converting step converts at a coding rate of m/n, which is greater than 2/3.

25. The method of claim 24, wherein n is equal one of 13, 16, and 19.

26. The method of claim 24, wherein m is equal to one of 9, 11, and 13.

27. The method of claim 1, further comprising:

generating a modulated signal from the n-bit code words.

28. The method of claim 27, further comprising:

recording the modulated signal in a recording medium.

29. The method of claim 27, further comprising:

transmitting the modulated signal.

30. The method of claim 1, wherein the converting step converts the m-bit information words into the n-bit code words using a translation table.

31. A method of converting, comprising:

receiving m-bit information words, where m is an integer;

converting the m-bit information words into n-bit code words, where n is an integer greater than m, at a coding rate m/n greater than 2/3.

32. A method of converting, comprising:

receiving m-bit information words, where m is an integer;

converting the m-bit information words into n-bit code words that satisfy a dk-constraint, where n is an integer greater than m, d indicates a minimum number of zeros between consecutive ones in the n-bit code words and k indicates a maximum number of zeros between consecutive ones in the n-bit code words, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is converted into an n-bit code word of the first or second kind if the previous m-bit information word was converted into an n-bit code word of the first type and is converted into an n-bit code word of the first kind if the previous m-bit information word was converted into an n-bit code word of the second type, the n-bit code words of the first type ending in zero, the n-bit code words of the second type ending in one, the n-bit code words in a coding state of the first kind starting with zero and the n-bit code words in a coding state of the second kind starting

with zero or one, and the n-bit code words being divided into p coding states of the first kind and q coding states of the second kind, where p and q are integers greater than or equal to 1, and each of the p and q coding states have n-bit code words different from the n-bit code words in the other p and q coding states.

33. A coding device, comprising:

a converter receiving m-bit information words, where m is an integer and converting the m-bit information words into n-bit code words, where n is an integer greater than m, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is converted into an n-bit code word of the first or second kind if the previous m-bit information word was converted into an n-bit code word of the first type and is converted into an n-bit code word of the first kind if the previous m-bit information word was converted into an n-bit code word of the second type.

34. The coding device of claim 33, wherein the converter receives a coding state with each m-bit information word and converts the m-bit information word into the n-bit code word based on the coding state.

35. The coding device of claim 34, further comprising:

a buffer supplying the coding state to the converter; and wherein

the converter determines the coding state for the next m-bit information word as part of the converting process, and stores the determined coding state in the buffer.

36. The coding device of claim 35, wherein the converter converts the m-bit information word into the n-bit code word and determines the coding state using a translation table.

37. The coding device of claim 33, further comprising:

a modulator generating a modulated signal from the n-bit code words.

38. The coding device of claim 37, further comprising:

a recording device recording the modulated signal in a recording medium.

39. The coding device of claim 37, further comprising:

a transmitter transmitting the modulated signal.

40. A method of manufacturing a recording medium, comprising:

converting m-bit information words into n-bit code words, where n is an integer greater than m, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is converted into an n-bit code word of the first or second kind if the previous m-bit information word was converted into an n-bit code word of the first type and is converted into an n-bit code word of the first kind if the previous m-bit information word was converted into an n-bit code word of the second type;

generating a modulated signal from the n-bit code words; and

recording the modulated signal in a recording medium.

41. A recording medium having a modulated signal recorded in a track, the modulated signal including signal portions representing n-bit code words, where n is an integer, each n-bit code word representing an m-bit information word, where m is an integer less than n, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is represented by an n-bit code word of the first or second kind if the previous m-bit information word is represented by an n-bit code word of the first type and is represented by an n-bit code word of the first kind if the

previous m-bit information word is represented by an n-bit code word of the second type.

42. The recording medium of claim 41, wherein the signal portions represent the n-bit code words such that each successive n-bit code word partially instructs a reproducing device on which of at least two m-bit information words are represented by each previous n-bit code word.

43. A modulated signal, comprising:

signal portions representing n-bit code words, where n is an integer, each n-bit code word representing an m-bit information word, where m is an integer less than n, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is represented by an n-bit code word of the first or second kind if the previous m-bit information word is represented by an n-bit code word of the first type and is represented by an n-bit code word of the first kind if the previous m-bit information word is represented by an n-bit code word of the second type.

44. The modulated signal of claim 43, wherein the signal portions represent the n-bit code words such that each successive n-bit code word partially instructs a reproducing device on which of at least two m-bit information words are represented by each previous n-bit code word.

45. A method of decoding, comprising:

receiving n-bit code words, where n is an integer;

converting the n-bit code words into m-bit information words, where m is an integer less than n, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is represented by an n-bit code word of the first or second

kind if the previous n-bit code word is of the first type and is represented by an n-bit code word of the first kind if the previous n-bit code word is of the second type.

46. The method of claim 45, wherein the n-bit code words are divided into p coding states of the first kind and q coding states of the second kind, where p and q are integers greater than or equal to 1, and each of the p and q coding states have n-bit code words different from the n-bit code words in the other p and q coding states.

47. The method of claim 46, wherein the converting step determines to which of the p and q coding states a next n-bit code word belongs, and converts a current n-bit code word into an m-bit information word based on the determined coding state.

48. The method of claim 47, wherein at least one of the p and q coding states includes more than one of a same n-bit code word, the same n-bit code word maps to more than one of the m-bit information words, and each same n-bit code word has a different state direction associated therewith, each state direction indicating a next one of the p and q coding states from which to obtain the next n-bit code word when converting the m-bit information words into the n-bit code words.

49. The method of claim 48, wherein the n-bit code words satisfy a dk-constraint, where d indicates a minimum number of zeros between consecutive ones in the n-bit code words and k indicates a maximum number of zeros between consecutive ones in the n-bit code words.

50. The method of claim 49, wherein m/n is greater than 2/3, and d = 1.

51. The method of claim 50, wherein p+q equals 5.

52. The method of claim 50, wherein p+q equals 13.

53. The method of claim 49, wherein the n-bit code words of the first type end in zero, the n-bit code words of the second type end in one, the n-bit code words in a coding state of the first kind start with zero, and the n-bit code words in a coding state of the second kind start with zero or one.

54. The method of claim 45, further comprising:

receiving a modulated signal; and

demodulating the modulated signal into at least the n-bit code words.

55. The method of claim 45, further comprising:

reproducing a modulated signal from a recording medium; and

demodulating the modulated signal into at least the n-bit code words.

56. A method of decoding, comprising:

receiving n-bit code words, where n is an integer;

determining a coding state of a next n-bit code word; and

converting a current n-bit code word into an m-bit information word, where m is an integer less than n, based on the determined coding state.

57. The method of claim 56, wherein each n-bit code word belongs to a coding state, at least one of the coding states includes more than one of a same n-bit code word, the same n-bit code word maps to more than one of the m-bit information words, and each same n-bit code word has a different state direction associated therewith, each state direction indicating a next one of the coding states from which to obtain the next n-bit code word when converting the m-bit information words into the n-bit code words.

58. The method of claim 56, further comprising:

receiving a modulated signal; and

demodulating the modulated signal into at least the n-bit code words.

59. The method of claim 56, further comprising:

reproducing a modulated signal from a recording medium; and

demodulating the modulated signal into at least the n-bit code words.

60. A decoding device, comprising:

a converter receiving n-bit code words, where n is an integer, and converting the n-bit code words into m-bit information words, where m is an integer less than n, the n-bit code words being divided into a first type and a second type and into coding states of a first kind and a second kind such that an m-bit information word is represented by an n-bit code word of the first or second kind if the previous n-bit code word is of the first type and is represented by an n-bit code word of the first kind if the previous n-bit code word is of the second type.

61. The decoding device of claim 60, wherein the n-bit code words are divided into p coding states of the first kind and q coding states of the second kind, where p and q are integers greater than or equal to 1, and each of the p and q coding states have n-bit code words different from the n-bit code words in the other p and q coding states.

62. The decoding device of claim 61, wherein the converter determines to which of the p and q coding states a next n-bit code word belongs, and converts a current n-bit code word into an m-bit information word based on the determined coding state.

63. The decoding device of claim 62, wherein at least one of the p and q coding states includes more than one of a same n-bit code word, the same n-bit code

word maps to more than one of the m-bit information words, and each same n-bit code word has a different state direction associated therewith, each state direction indicating a next one of the p and q coding states from which to obtain the next n-bit code word when converting the m-bit information words into the n-bit code words.

64. The decoding device of claim 63, wherein the n-bit code words satisfy a dk-constraint, where d indicates a minimum number of zeros between consecutive ones in the n-bit code words and k indicates a maximum number of zeros between consecutive ones in the n-bit code words.

65. The decoding device of claim 64, wherein m/n is greater than 2/3, and d = 1.

66. The decoding device of claim 65, wherein p+q equals 5.

67. The decoding device of claim 65, wherein p+q equals 13.

68. The decoding device of claim 64, wherein the n-bit code words of the first type end in zero, the n-bit code words of the second type end in one, the n-bit code words in a coding state of the first kind start with zero, and the n-bit code words in a coding state of the second kind start with zero or one.

69. The decoding device of claim 60, further comprising:

a demodulator receiving a modulated signal and demodulating the modulated signal into at least the n-bit code words.

70. The decoding device of claim 60, further comprising:

a reproducing device reproducing a modulated signal from a recording medium, and demodulating the modulated signal into at least the n-bit code words.

71. A decoding device, comprising:

a first translator receiving a next n-bit code words, where n is an integer, and determining a coding state of the next n-bit code word;

a second translator receiving a current n-bit code word and the determined coding state, and converting the current n-bit code word into an m-bit information word, where m is an integer less than n, based on the determined coding state.

72. The decoding device of claim 71, wherein each n-bit code word belongs to a coding state, at least one of the coding states includes more than one of a same n-bit code word, the same n-bit code word maps to more than one of the m-bit information words, and each same n-bit code word has a different state direction associated therewith, each state direction indicating a next one of the coding states from which to obtain the next n-bit code word when converting the m-bit information words into the n-bit code words.

73. The decoding device of claim 71, further comprising:

a demodulator receiving a modulated signal and demodulating the modulated signal into at least the n-bit code words.

74. The decoding device of claim 71, further comprising:

a reproducing device reproducing a modulated signal from a recording medium, and demodulating the modulated signal into at least the n-bit code words.

ABSTRACT OF THE DISCLOSURE

In the coding device and method, m-bit information words are converted into n-bit code words such that the coding rate m/n is greater than 2/3. The n-bit code words are divided into a first type and a second type, and into coding states of a first kind and a second kind such that an m-bit information word is converted into an n-bit code word of the first or second kind if the previous m-bit information word was converted into an n-bit code word of the first type and is converted into an n-bit code word of the first kind if the previous m-bit information word was converted into an n-bit code word of the second type. In one embodiment, n-bit code words of the first type end in zero, n-bit code words of the second type end in one, n-bit code words of the first kind start with zero, and n-bit code words of the second kind start with zero or one. Furthermore, in the embodiments, the n-bit code words satisfy a dk-constraint of (1,k) such that a minimum of 1 zero and a maximum of k zeros falls between consecutive ones. The coding device and method are employed to record information on a recording medium and thus create the recording medium. The coding device and method are further employed to transmit information. In the decoding method and apparatus, n-bit code words are decoded into m-bit information words. The decoding involves determining the state of a next n-bit code word, and based on the state determination, the current n-bit code word is converted into an m-bit information word. The decoding device and method are employed to reproduce information from a recording medium, and to receive information transmitted over a medium.

FIG. 1
BACKGROUND ART

k	C(1,k)
7	0.67929
8	0.68525
9	0.68879
INF.	0.69424

FIG. 2

	1st KIND			2nd KIND	
SUBGROUP	STATE 1	STATE 2	STATE 3	STATE 4	STATE 5
E00	76	76	76	1	1
E01	44	44	44	5	6
E10	0	0	0	72	71
E11	0	0	0	44	45

FIG. 3

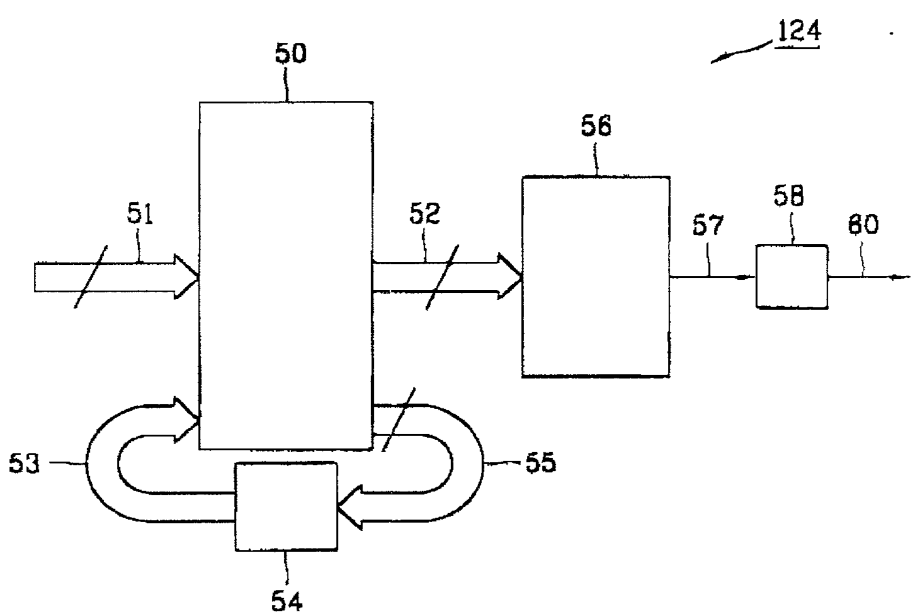

FIG. 4A

		State 1		State 2		State 3		State 4		State 5	
	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
0	000000000	0000000000100	1	0001010001010	1	0101000000100	1	0101000000000	1	1010101010101	3
1	000000001	0000000000100	2	0001010001010	2	0101000000100	2	0101000000000	2	0010000000000	2
2	000000010	0000000000100	3	0001010001010	3	0101000000100	3	0101000000000	3	0010000000000	3
3	000000011	0000000000100	4	0001010001010	4	0101000000100	4	0101000000000	4	0010000000000	4
4	000000100	0000000000100	5	0001010001010	5	0101000000100	5	0101000000000	5	0010000000000	5
5	000000101	0000000001000	1	0001010010010	1	0100000100100	1	0101001001001	1	0101010001001	1
6	000000110	0000000001000	2	0001010010010	2	0100000100100	2	0101001001001	2	0101010001001	2
7	000000111	0000000001000	3	0001010010010	3	0100000100100	3	0101001001001	3	0101010001001	3
8	000001000	0000000001000	4	0001010010010	4	0100000100100	4	0101001010001	1	0101010010001	1
9	000001001	0000000001000	5	0001010010010	5	0100000100100	5	0101001010001	2	0101010010001	2
10	000001010	0000000001010	1	0001010100010	1	0010100000100	1	0101001010001	3	0101010010001	3
11	000001011	0000000001010	2	0001010100010	2	0010100000100	2	0101001010101	1	0101010010101	1
12	000001100	0000000001010	3	0001010100010	3	0010100000100	3	0101001010101	2	0101010010101	2
13	000001101	0000000001010	4	0001010100010	4	0010100000100	4	0101001010101	3	0101010010101	3
14	000001110	0000000001010	5	0001010100010	5	0010100000100	5	0101010000001	1	0101010100001	1
15	000001111	0000000010000	1	0001010101010	1	0101000010100	1	0101010000001	2	0101010100001	2
16	000010000	0000000010000	2	0001010101010	2	0101000010100	2	0101010000001	3	0101010100001	3
17	000010001	0000000010000	3	0001010101010	3	0101000010100	3	0101010000101	1	0101010100101	1
18	000010010	0000000010000	4	0001010101010	4	0101000010100	4	0101010000101	2	0101010100101	2
19	000010011	0000000010000	5	0001010101010	5	0101000010100	5	0101010000101	3	0101010100101	3
20	000010100	0000000010010	1	0010000000010	1	0010000010100	1	1000000000010	1	0101010101001	1
21	000010101	0000000010010	2	0010000000010	2	0010000010100	2	1000000000010	2	0101010101001	2
22	000010110	0000000010010	3	0010000000010	3	0010000010100	3	1000000000010	3	0101010101001	3
23	000010111	0000000010010	4	0010000000010	4	0010000010100	4	1000000000010	4	1010010010100	1
24	000011000	0000000010010	5	0010000000010	5	0010000010100	5	1000000000010	5	1010010010100	2
25	000011001	0000000010100	1	0010000001010	1	0101000100100	1	1000000001010	1	1010010010100	3
26	000011010	0000000010100	2	0010000001010	2	0101000100100	2	1000000001010	2	1010010010100	4
27	000011011	0000000010100	3	0010000001010	3	0101000100100	3	1000000001010	3	1010010010100	5
28	000011100	0000000010100	4	0010000001010	4	0101000100100	4	1000000001010	4	1000010010100	1
29	000011101	0000000010100	5	0010000001010	5	0101000100100	5	1000000001010	5	1000010010100	2
30	000011110	0000000100000	1	0010000010010	1	0100001000100	1	1000000010010	1	1000010010100	3
31	000011111	0000000100000	2	0010000010010	2	0100001000100	2	1000000010010	2	1000010010100	4
32	000100000	0000000100000	3	0010000010010	3	0100001000100	3	1000000010010	3	1000010010100	5
33	000100001	0000000100000	4	0010000010010	4	0100001000100	4	1000000010010	4	1010010100100	1
34	000100010	0000000100000	5	0010000010010	5	0100001000100	5	1000000010010	5	1010010100100	2
35	000100011	0000000100010	1	0010000100010	1	0010001010100	1	1000000100010	1	1010010100100	3
36	000100100	0000000100010	2	0010000100010	2	0010001010100	2	1000000100010	2	1010010100100	4
37	000100101	0000000100010	3	0010000100010	3	0010001010100	3	1000000100010	3	1010010100100	5
38	000100110	0000000100010	4	0010000100010	4	0010001010100	4	1000000100010	4	1001001010100	1
39	000100111	0000000100010	5	0010000100010	5	0010001010100	5	1000000100010	5	1001001010100	2
40	000101000	0000000100100	1	0010000101010	1	0101001000100	1	1000000101010	1	1001001010100	3
41	000101001	0000000100100	2	0010000101010	2	0101001000100	2	1000000101010	2	1001001010100	4
42	000101010	0000000100100	3	0010000101010	3	0101001000100	3	1000000101010	3	1001001010100	5
43	000101011	0000000100100	4	0010000101010	4	0101001000100	4	1000000101010	4	1000000010100	1
44	000101100	0000000100100	5	0010000101010	5	0101001000100	5	1000000101010	5	1000000010100	2
45	000101101	0000000101000	1	0010001000010	1	0010100010100	1	1000001000010	1	1000000010100	3
46	000101110	0000000101000	2	0010001000010	2	0010100010100	2	1000001000010	2	1000000010100	4
47	000101111	0000000101000	3	0010001000010	3	0010100010100	3	1000001000010	3	1000000010100	5
48	000110000	0000000101000	4	0010001000010	4	0010100010100	4	1000001000010	4	1010100000100	1
49	000110001	0000000101000	5	0010001000010	5	0010100010100	5	1000001000010	5	1010100000100	2
50	000110010	0000000101010	1	0010001001010	1	0100001010100	1	1000001001010	1	1010100000100	3
51	000110011	0000000101010	2	0010001001010	2	0100001010100	2	1000001001010	2	1010100000100	4
52	000110100	0000000101010	3	0010001001010	3	0100001010100	3	1000001001010	3	1010100000100	5
53	000110101	0000000101010	4	0010001001010	4	0100001010100	4	1000001001010	4	1001010000100	1
54	000110110	0000000101010	5	0010001001010	5	0100001010100	5	1000001001010	5	1001010000100	2
55	000110111	0000001000000	1	0010001010010	1	0101001010100	1	1000001010010	1	1001010000100	3
56	000111000	0000001000000	2	0010001010010	2	0101001010100	2	1000001010010	2	1001010000100	4
57	000111001	0000001000000	3	0010001010010	3	0101001010100	3	1000001010010	3	1001010000100	5
58	000111010	0000001000000	4	0010001010010	4	0101001010100	4	1000001010010	4	1000101000100	1
59	000111011	0000001000000	5	0010001010010	5	0101001010100	5	1000001010010	5	1000101000100	2
60	000111100	0000001000010	1	0010010000010	1	0001010000100	1	1000010000010	1	1000101000100	3
61	000111101	0000001000010	2	0010010000010	2	0001010000100	2	1000010000010	2	1000101000100	4
62	000111110	0000001000010	3	0010010000010	3	0001010000100	3	1000010000010	3	1000101000100	5
63	000111111	0000001000010	4	0010010000010	4	0001010000100	4	1000010000010	4	1010100010100	1

FIG. 4B

	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
64	001000000	0000001000010	5	0010010000010	5	0001010000100	5	1000010000010	5	1010100010100	2
65	001000001	0000001000100	1	0010010001010	1	0101010000100	1	1000010001010	1	1010100010100	3
66	001000010	0000001000100	2	0010010001010	2	0101010000100	2	1000010001010	2	1010100010100	4
67	001000011	0000001000100	3	0010010001010	3	0101010000100	3	1000010001010	3	1010100010100	5
68	001000100	0000001000100	4	0010010001010	4	0101010000100	4	1000010001010	4	1000010100100	1
69	001000101	0000001000100	5	0010010001010	5	0101010000100	5	1000010001010	5	1000010100100	2
70	001000110	0000001001000	1	0010010010010	1	0100010000100	1	1000010010010	1	1000010100100	3
71	001000111	0000001001000	2	0010010010010	2	0100010000100	2	1000010010010	2	1000010100100	4
72	001001000	0000001001000	3	0010010010010	3	0100010000100	3	1000010010010	3	1000010100100	5
73	001001001	0000001001000	4	0010010010010	4	0100010000100	4	1000010010010	4	1010100100100	1
74	001001010	0000001001000	5	0010010010010	5	0100010000100	5	1000010010010	5	1010100100100	2
75	001001011	0000001001010	1	0010010100010	1	0010100100100	1	1000010100010	1	1010100100100	3
76	001001100	0000001001010	2	0010010100010	2	0010100100100	2	1000010100010	2	1010100100100	4
77	001001101	0000001001010	3	0010010100010	3	0010100100100	3	1000010100010	3	1010100100100	5
78	001001110	0000001001010	4	0010010100010	4	0010100100100	4	1000010100010	4	1001010010100	1
79	001001111	0000001001010	5	0010010100010	5	0010100100100	5	1000010100010	5	1001010010100	2
80	001010000	0000001010000	1	0010010101010	1	0101010010100	1	1000010101010	1	1001010010100	3
81	001010001	0000001010000	2	0010010101010	2	0101010010100	2	1000010101010	2	1001010010100	4
82	001010010	0000001010000	3	0010010101010	3	0101010010100	3	1000010101010	3	1001010010100	5
83	001010011	0000001010000	4	0010010101010	4	0101010010100	4	1000010101010	4	1000001010100	1
84	001010100	0000001010000	5	0010010101010	5	0101010010100	5	1000010101010	5	1000001010100	2
85	001010101	0000001010010	1	0010100000010	1	0010010000100	1	1000100000010	1	1000001010100	3
86	001010110	0000001010010	2	0010100000010	2	0010010000100	2	1000100000010	2	1000001010100	4
87	001010111	0000001010010	3	0010100000010	3	0010010000100	3	1000100000010	3	1000001010100	5
88	001011000	0000001010010	4	0010100000010	4	0010010000100	4	1000100000010	4	1010101000100	1
89	001011001	0000001010010	5	0010100000010	5	0010010000100	5	1000100000010	5	1010101000100	2
90	001011010	0000001010100	1	0010100001010	1	0101010100100	1	1000100001010	1	1010101000100	3
91	001011011	0000001010100	2	0010100001010	2	0101010100100	2	1000100001010	2	1010101000100	4
92	001011100	0000001010100	3	0010100001010	3	0101010100100	3	1000100001010	3	1010101000100	5
93	001011101	0000001010100	4	0010100001010	4	0101010100100	4	1000100001010	4	1001010100100	1
94	001011110	0000001010100	5	0010100001010	5	0101010100100	5	1000100001010	5	1001010100100	2
95	001011111	0000010000000	1	0010100010010	1	0100010010100	1	1000100010010	1	1001010100100	3
96	001100000	0000010000000	2	0010100010010	2	0100010010100	2	1000100010010	2	1001010100100	4
97	001100001	0000010000000	3	0010100010010	3	0100010010100	3	1000100010010	3	1001010100100	5
98	001100010	0000010000000	4	0010100010010	4	0100010010100	4	1000100010010	4	1000101010100	1
99	001100011	0000010000000	5	0010100010010	5	0100010010100	5	1000100010010	5	1000101010100	2
100	001100100	0000010000010	1	0010100100010	1	0010001001000	1	1000100100010	1	1000101010100	3
101	001100101	0000010000010	2	0010100100010	2	0010001001000	2	1000100100010	2	1000101010100	4
102	001100110	0000010000010	3	0010100100010	3	0010001001000	3	1000100100010	3	1000101010100	5
103	001100111	0000010000010	4	0010100100010	4	0010001001000	4	1000100100010	4	1010101010100	1
104	001101000	0000010000010	5	0010100100010	5	0010001001000	5	1000100100010	5	1010101010100	2
105	001101001	0000010000100	1	0010100101010	1	0100001001000	1	1000100101010	1	1010101010100	3
106	001101010	0000010000100	2	0010100101010	2	0100001001000	2	1000100101010	2	1010101010100	4
107	001101011	0000010000100	3	0010100101010	3	0100001001000	3	1000100101010	3	1010101010100	5
108	001101100	0000010000100	4	0010100101010	4	0100001001000	4	1000100101010	4	1000101001000	1
109	001101101	0000010000100	5	0010100101010	5	0100001001000	5	1000100101010	5	1000101001000	2
110	001101110	0000010001000	1	0010101000010	1	0100100001000	1	1000101000010	1	1000101001000	3
111	001101111	0000010001000	2	0010101000010	2	0100100001000	2	1000101000010	2	1000101001000	4
112	001110000	0000010001000	3	0010101000010	3	0100100001000	3	1000101000010	3	1000101001000	5
113	001110001	0000010001000	4	0010101000010	4	0100100001000	4	1000101000010	4	1000000101000	1
114	001110010	0000010001000	5	0010101000010	5	0100100001000	5	1000101000010	5	1000000101000	2
115	001110011	0000010001010	1	0010101001010	1	0010010101000	1	1000101001010	1	1000000101000	3
116	001110100	0000010001010	2	0010101001010	2	0010010101000	2	1000101001010	2	1000000101000	4
117	001110101	0000010001010	3	0010101001010	3	0010010101000	3	1000101001010	3	1000000101000	5
118	001110110	0000010001010	4	0010101001010	4	0010010101000	4	1000101001010	4	1001010001000	1
119	001110111	0000010001010	5	0010101001010	5	0010010101000	5	1000101001010	5	1001010001000	2
120	001111000	0000010010000	1	0010101010010	1	0010010001000	1	1000101010010	1	1001010001000	3
121	001111001	0000010010000	2	0010101010010	2	0010010001000	2	1000101010010	2	1001010001000	4
122	001111010	0000010010000	3	0010101010010	3	0010010001000	3	1000101010010	3	1001010001000	5
123	001111011	0000010010000	4	0010101010010	4	0010010001000	4	1000101010010	4	1010010101000	1
124	001111100	0000010010000	5	0010101010010	5	0010010001000	5	1000101010010	5	1010010101000	2
125	001111101	0000010010010	1	0100000000010	1	0101000101000	1	1001000000010	1	1010010101000	3
126	001111110	0000010010010	2	0100000000010	2	0101000101000	2	1001000000010	2	1010010101000	4
127	001111111	0000010010010	3	0100000000010	3	0101000101000	3	1001000000010	3	1010010101000	5

FIG. 4C

	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
128	010000000	0000010010010	4	0100000000010	4	0101000101000	4	1001000000010	4	1000000001000	1
129	010000001	0000010010010	5	0100000000010	5	0101000101000	5	1001000000010	5	1000000001000	2
130	010000010	0000010010100	1	0100000001010	1	0100000001000	1	1001000001010	1	1000000001000	3
131	010000011	0000010010100	2	0100000001010	2	0100000001000	2	1001000001010	2	1000000001000	4
132	010000100	0000010010100	3	0100000001010	3	0100000001000	3	1001000001010	3	1000000001000	5
133	010000101	0000010010100	4	0100000001010	4	0100000001000	4	1001000001010	4	1010000101000	1
134	010000110	0000010010100	5	0100000001010	5	0100000001000	5	1001000001010	5	1010000101000	2
135	010000111	0000010100000	1	0100000010010	1	0010100101000	1	1001000010010	1	1010000101000	3
136	010001000	0000010100000	2	0100000010010	2	0010100101000	2	1001000010010	2	1010000101000	4
137	010001001	0000010100000	3	0100000010010	3	0010100101000	3	1001000010010	3	1010000101000	5
138	010001010	0000010100000	4	0100000010010	4	0010100101000	4	1001000010010	4	1001000101000	1
139	010001011	0000010100000	5	0100000010010	5	0010100101000	5	1001000010010	5	1001000101000	2
140	010001100	0000010100010	1	0100000100010	1	0010000101000	1	1001000100010	1	1001000101000	3
141	010001101	0000010100010	2	0100000100010	2	0010000101000	2	1001000100010	2	1001000101000	4
142	010001110	0000010100010	3	0100000100010	3	0010000101000	3	1001000100010	3	1001000101000	5
143	010001111	0000010100010	4	0100000100010	4	0010000101000	4	1001000100010	4	1010100001000	1
144	010010000	0000010100010	5	0100000100010	5	0010000101000	5	1001000100010	5	1010100001000	2
145	010010001	0000010100100	1	0100000101010	1	0101001001000	1	1001000101010	1	1010100001000	3
146	010010010	0000010100100	2	0100000101010	2	0101001001000	2	1001000101010	2	1010100001000	4
147	010010011	0000010100100	3	0100000101010	3	0101001001000	3	1001000101010	3	1010100001000	5
148	010010100	0000010100100	4	0100000101010	4	0101001001000	4	1001000101010	4	1000010001000	1
149	010010101	0000010100100	5	0100000101010	5	0101001001000	5	1001000101010	5	1000010001000	2
150	010010110	0000010101000	1	0100001000010	1	0100100101000	1	1001001000010	1	1000010001000	3
151	010010111	0000010101000	2	0100001000010	2	0100100101000	2	1001001000010	2	1000010001000	4
152	010011000	0000010101000	3	0100001000010	3	0100100101000	3	1001001000010	3	1000010001000	5
153	010011001	0000010101000	4	0100001000010	4	0100100101000	4	1001001000010	4	1000100101000	1
154	010011010	0000010101000	5	0100001000010	5	0100100101000	5	1001001000010	5	1000100101000	2
155	010011011	0000010101010	1	0100001001010	1	0100010001000	1	1001001001010	1	1000100101000	3
156	010011100	0000010101010	2	0100001001010	2	0100010001000	2	1001001001010	2	1000100101000	4
157	010011101	0000010101010	3	0100001001010	3	0100010001000	3	1001001001010	3	1000100101000	5
158	010011110	0000010101010	4	0100001001010	4	0100010001000	4	1001001001010	4	1010001001000	1
159	010011111	0000010101010	5	0100001001010	5	0100010001000	5	1001001001010	5	1010001001000	2
160	010100000	0000100000000	1	0100001010010	1	0010000001000	1	1001001010010	1	1010001001000	3
161	010100001	0000100000000	2	0100001010010	2	0010000001000	2	1001001010010	2	1010001001000	4
162	010100010	0000100000000	3	0100001010010	3	0010000001000	3	1001001010010	3	1010001001000	5
163	010100011	0000100000000	4	0100001010010	4	0010000001000	4	1001001010010	4	1000100001000	1
164	010100100	0000100000000	5	0100001010010	5	0010000001000	5	1001001010010	5	1000100001000	2
165	010100101	0000100000010	1	0100010000010	1	0010100001000	1	1001010000010	1	1000100001000	3
166	010100110	0000100000010	2	0100010000010	2	0010100001000	2	1001010000010	2	1000100001000	4
167	010100111	0000100000010	3	0100010000010	3	0010100001000	3	1001010000010	3	1000100001000	5
168	010101000	0000100000010	4	0100010000010	4	0010100001000	4	1001010000010	4	1001010101000	1
169	010101001	0000100000010	5	0100010000010	5	0010100001000	5	1001010000010	5	1001010101000	2
170	010101010	0000100000100	1	0100010001010	1	0100101001000	1	1001010001010	1	1001010101000	3
171	010101011	0000100000100	2	0100010001010	2	0100101001000	2	1001010001010	2	1001010101000	4
172	010101100	0000100000100	3	0100010001010	3	0100101001000	3	1001010001010	3	1001010101000	5
173	010101101	0000100000100	4	0100010001010	4	0100101001000	4	1001010001010	4	1010100101000	1
174	010101110	0000100000100	5	0100010001010	5	0100101001000	5	1001010001010	5	1010100101000	2
175	010101111	0000100001000	1	0100010010010	1	0101010001000	1	1001010010010	1	1010100101000	3
176	010110000	0000100001000	2	0100010010010	2	0101010001000	2	1001010010010	2	1010100101000	4
177	010110001	0000100001000	3	0100010010010	3	0101010001000	3	1001010010010	3	1010100101000	5
178	010110010	0000100001000	4	0100010010010	4	0101010001000	4	1001010010010	4	1001001001000	1
179	010110011	0000100001000	5	0100010010010	5	0101010001000	5	1001010010010	5	1001001001000	2
180	010110100	0000100001010	1	0100010100010	1	0010101001000	1	1001010100010	1	1001001001000	3
181	010110101	0000100001010	2	0100010100010	2	0010101001000	2	1001010100010	2	1001001001000	4
182	010110110	0000100001010	3	0100010100010	3	0010101001000	3	1001010100010	3	1001001001000	5
183	010110111	0000100001010	4	0100010100010	4	0010101001000	4	1001010100010	4	1001000001000	1
184	010111000	0000100001010	5	0100010100010	5	0010101001000	5	1001010100010	5	1001000001000	2
185	010111001	0000100010000	1	0100010101010	1	0100000101000	1	1001010101010	1	1001000001000	3
186	010111010	0000100010000	2	0100010101010	2	0100000101000	2	1001010101010	2	1001000001000	4
187	010111011	0000100010000	3	0100010101010	3	0100000101000	3	1001010101010	3	1001000001000	5
188	010111100	0000100010000	4	0100010101010	4	0100000101000	4	1001010101010	4	1000001001000	1
189	010111101	0000100010000	5	0100010101010	5	0100000101000	5	1001010101010	5	1000001001000	2
190	010111110	0000100010010	1	0100100000010	1	0001010101000	1	1010000000010	1	1000001001000	3
191	010111111	0000100010010	2	0100100000010	2	0001010101000	2	1010000000010	2	1000001001000	4

FIG. 4D

Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
192 011000000	0000100010010	3	0100100000010	3	0001010101000	3	1010000000010	3	1000001001000	5
193 011000001	0000100010010	4	0100100000010	4	0001010101000	4	1010000000010	4	1010101001000	1
194 011000010	0000100010010	5	0100100000010	5	0001010101000	5	1010000000010	5	1010101001000	2
195 011000011	0000100010100	1	0100100001010	1	0100010101000	1	1010000001010	1	1010101001000	3
196 011000100	0000100010100	2	0100100001010	2	0100010101000	2	1010000001010	2	1010101001000	4
197 011000101	0000100010100	3	0100100001010	3	0100010101000	3	1010000001010	3	1010101001000	5
198 011000110	0000100010100	4	0100100001010	4	0100010101000	4	1010000001010	4	1010010001000	1
199 011000111	0000100010100	5	0100100001010	5	0100010101000	5	1010000001010	5	1010010001000	2
200 011001000	0000100100000	1	0100100010010	1	0001010001000	1	1010000010010	1	1010010001000	3
201 011001001	0000100100000	2	0100100010010	2	0001010001000	2	1010000010010	2	1010010001000	4
202 011001010	0000100100000	3	0100100010010	3	0001010001000	3	1010000010010	3	1010010001000	5
203 011001011	0000100100000	4	0100100010010	4	0001010001000	4	1010000010010	4	1010000001000	1
204 011001100	0000100100000	5	0100100010010	5	0001010001000	5	1010000010010	5	1010000001000	2
205 011001101	0000100100010	1	0100100100010	1	0101010101000	1	1010000100010	1	1010000001000	3
206 011001110	0000100100010	2	0100100100010	2	0101010101000	2	1010000100010	2	1010000001000	4
207 011001111	0000100100010	3	0100100100010	3	0101010101000	3	1010000100010	3	1010000001000	5
208 011010000	0000100100010	4	0100100100010	4	0101010101000	4	1010000100010	4	1000010101000	1
209 011010001	0000100100010	5	0100100100010	5	0101010101000	5	1010000100010	5	1000010101000	2
210 011010010	0000100100100	1	0100100101010	1	0101000001000	1	1010000101010	1	1000010101000	3
211 011010011	0000100100100	2	0100100101010	2	0101000001000	2	1010000101010	2	1000010101000	4
212 011010100	0000100100100	3	0100100101010	3	0101000001000	3	1010000101010	3	1000010101000	5
213 011010101	0000100100100	4	0100100101010	4	0101000001000	4	1010000101010	4	1010010010000	1
214 011010110	0000100100100	5	0100100101010	5	0101000001000	5	1010000101010	5	1010010010000	2
215 011010111	0000100101000	1	0100101000010	1	0101001010000	1	1010001000010	1	1010010010000	3
216 011011000	0000100101000	2	0100101000010	2	0101001010000	2	1010001000010	2	1010010010000	4
217 011011001	0000100101000	3	0100101000010	3	0101001010000	3	1010001000010	3	1010010010000	5
218 011011010	0000100101000	4	0100101000010	4	0101001010000	4	1010001000010	4	1000000010000	1
219 011011011	0000100101000	5	0100101000010	5	0101001010000	5	1010001000010	5	1000000010000	2
220 011011100	0000100101010	1	0100101001010	1	0010001010000	1	1010001001010	1	1000000010000	3
221 011011101	0000100101010	2	0100101001010	2	0010001010000	2	1010001001010	2	1000000010000	4
222 011011110	0000100101010	3	0100101001010	3	0010001010000	3	1010001001010	3	1000000010000	5
223 011011111	0000100101010	4	0100101001010	4	0010001010000	4	1010001001010	4	1010000010000	1
224 011100000	0000100101010	5	0100101001010	5	0010001010000	5	1010001001010	5	1010000010000	2
225 011100001	0000101000000	1	0100101010010	1	0101000010000	1	1010001010010	1	1010000010000	3
226 011100010	0000101000000	2	0100101010010	2	0101000010000	2	1010001010010	2	1010000010000	4
227 011100011	0000101000000	3	0100101010010	3	0101000010000	3	1010001010010	3	1010000010000	5
228 011100100	0000101000000	4	0100101010010	4	0101000010000	4	1010001010010	4	1001000010000	1
229 011100101	0000101000000	5	0100101010010	5	0101000010000	5	1010001010010	5	1001000010000	2
230 011100110	0000101000010	1	0101000000010	1	0010010010000	1	1010010000010	1	1001000010000	3
231 011100111	0000101000010	2	0101000000010	2	0010010010000	2	1010010000010	2	1001000010000	4
232 011101000	0000101000010	3	0101000000010	3	0010010010000	3	1010010000010	3	1001000010000	5
233 011101001	0000101000010	4	0101000000010	4	0010010010000	4	1010010000010	4	1010001010000	1
234 011101010	0000101000010	5	0101000000010	5	0010010010000	5	1010010000010	5	1010001010000	2
235 011101011	0000101000100	1	0101000001010	1	0100010010000	1	1010010001010	1	1010001010000	3
236 011101100	0000101000100	2	0101000001010	2	0100010010000	2	1010010001010	2	1010001010000	4
237 011101101	0000101000100	3	0101000001010	3	0100010010000	3	1010010001010	3	1010001010000	5
238 011101110	0000101000100	4	0101000001010	4	0100010010000	4	1010010001010	4	1000100010000	1
239 011101111	0000101000100	5	0101000001010	5	0100010010000	5	1010010001010	5	1000100010000	2
240 011110000	0000101001000	1	0101000010010	1	0001010010000	1	1010010010010	1	1000100010000	3
241 011110001	0000101001000	2	0101000010010	2	0001010010000	2	1010010010010	2	1000100010000	4
242 011110010	0000101001000	3	0101000010010	3	0001010010000	3	1010010010010	3	1000100010000	5
243 011110011	0000101001000	4	0101000010010	4	0001010010000	4	1010010010010	4	1000001010000	1
244 011110100	0000101001000	5	0101000010010	5	0001010010000	5	1010010010010	5	1000001010000	2
245 011110101	0000101001010	1	0101000100010	1	0100100010000	1	1010010100010	1	1000001010000	3
246 011110110	0000101001010	2	0101000100010	2	0100100010000	2	1010010100010	2	1000001010000	4
247 011110111	0000101001010	3	0101000100010	3	0100100010000	3	1010010100010	3	1000001010000	5
248 011111000	0000101001010	4	0101000100010	4	0100100010000	4	1010010100010	4	1000010010000	1
249 011111001	0000101001010	5	0101000100010	5	0100100010000	5	1010010100010	5	1000010010000	2
250 011111010	0000101010000	1	0101000101010	1	0101010010000	1	1010010101010	1	1000010010000	3
251 011111011	0000101010000	2	0101000101010	2	0101010010000	2	1010010101010	2	1000010010000	4
252 011111100	0000101010000	3	0101000101010	3	0101010010000	3	1010010101010	3	1000010010000	5
253 011111101	0000101010000	4	0101000101010	4	0101010010000	4	1010010101010	4	1000101010000	1
254 011111110	0000101010000	5	0101000101010	5	0101010010000	5	1010010101010	5	1000101010000	2
255 011111111	0000101010010	1	0101001000010	1	0100101010000	1	1010100000010	1	1000101010000	3

FIG. 4E

	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
256	100000000	0000101010010	2	0101001000010	2	0100101010000	2	1010100000010	2	1000101010000	4
257	100000001	0000101010010	3	0101001000010	3	0100101010000	3	1010100000010	3	1000101010000	5
258	100000010	0000101010010	4	0101001000010	4	0100101010000	4	1010100000010	4	1001010010000	1
259	100000011	0000101010010	5	0101001000010	5	0100101010000	5	1010100000010	5	1001010010000	2
260	100000100	0000101010100	1	0101001001010	1	0100001010000	1	1010100001010	1	1001010010000	3
261	100000101	0000101010100	2	0101001001010	2	0100001010000	2	1010100001010	2	1001010010000	4
262	100000110	0000101010100	3	0101001001010	3	0100001010000	3	1010100001010	3	1001010010000	5
263	100000111	0000101010100	4	0101001001010	4	0100001010000	4	1010100001010	4	1010101010000	1
264	100001000	0000101010100	5	0101001001010	5	0100001010000	5	1010100001010	5	1010101010000	2
265	100001001	0001000000000	1	0101001010010	1	0010000010000	1	1010100010010	1	1010101010000	3
266	100001010	0001000000000	2	0101001010010	2	0010000010000	2	1010100010010	2	1010101010000	4
267	100001011	0001000000000	3	0101001010010	3	0010000010000	3	1010100010010	3	1010101010000	5
268	100001100	0001000000000	4	0101001010010	4	0010000010000	4	1010100010010	4	1001001010000	1
269	100001101	0001000000000	5	0101001010010	5	0010000010000	5	1010100010010	5	1001001010000	2
270	100001110	0001000000010	1	0101010000010	1	0010100010000	1	1010100100010	1	1001001010000	3
271	100001111	0001000000010	2	0101010000010	2	0010100010000	2	1010100100010	2	1001001010000	4
272	100010000	0001000000010	3	0101010000010	3	0010100010000	3	1010100100010	3	1001001010000	5
273	100010001	0001000000010	4	0101010000010	4	0010100010000	4	1010100100010	4	1010100010000	1
274	100010010	0001000000010	5	0101010000010	5	0010100010000	5	1010100100010	5	1010100010000	2
275	100010011	0001000000100	1	0101010001010	1	0010101010000	1	1010100101010	1	1010100010000	3
276	100010100	0001000000100	2	0101010001010	2	0010101010000	2	1010100101010	2	1010100010000	4
277	100010101	0001000000100	3	0101010001010	3	0010101010000	3	1010100101010	3	1010100010000	5
278	100010110	0001000000100	4	0101010001010	4	0010101010000	4	1010100101010	4	1001000100000	1
279	100010111	0001000000100	5	0101010001010	5	0010101010000	5	1010100101010	5	1001000100000	2
280	100011000	0001000001000	1	0101010010010	1	0100000010000	1	1010101000010	1	1001000100000	3
281	100011001	0001000001000	2	0101010010010	2	0100000010000	2	1010101000010	2	1001000100000	4
282	100011010	0001000001000	3	0101010010010	3	0100000010000	3	1010101000010	3	1001000100000	5
283	100011011	0001000001000	4	0101010010010	4	0100000010000	4	1010101000010	4	1000010100000	1
284	100011100	0001000001000	5	0101010010010	5	0100000010000	5	1010101000010	5	1000010100000	2
285	100011101	0001000001010	1	0101010100010	1	0010000100000	1	1010101001010	1	1000010100000	3
286	100011110	0001000001010	2	0101010100010	2	0010000100000	2	1010101001010	2	1000010100000	4
287	100011111	0001000001010	3	0101010100010	3	0010000100000	3	1010101001010	3	1000010100000	5
288	100100000	0001000001010	4	0101010100010	4	0010000100000	4	1010101001010	4	1000000100000	1
289	100100001	0001000001010	5	0101010100010	5	0010000100000	5	1010101001010	5	1000000100000	2
290	100100010	0001000010000	1	0101010101010	1	0101000100000	1	1010101010010	1	1000000100000	3
291	100100011	0001000010000	2	0101010101010	2	0101000100000	2	1010101010010	2	1000000100000	4
292	100100100	0001000010000	3	0101010101010	3	0101000100000	3	1010101010010	3	1000000100000	5
293	100100101	0001000010000	4	0101010101010	4	0101000100000	4	1010101010010	4	1001010100000	1
294	100100110	0001000010000	5	0101010101010	5	0101000100000	5	1010101010010	5	1001010100000	2
295	100100111	0001000010010	1	0010000100100	1	0010100100000	1	1000000000100	1	1001010100000	3
296	100101000	0001000010010	2	0010000100100	2	0010100100000	2	1000000000100	2	1001010100000	4
297	100101001	0001000010010	3	0010000100100	3	0010100100000	3	1000000000100	3	1001010100000	5
298	100101010	0001000010010	4	0010000100100	4	0010100100000	4	1000000000100	4	1010100100000	1
299	100101011	0001000010010	5	0010000100100	5	0010100100000	5	1000000000100	5	1010100100000	2
300	100101100	0001000010100	1	0100010100100	1	0010010100000	1	1010000000100	1	1010100100000	3
301	100101101	0001000010100	2	0100010100100	2	0010010100000	2	1010000000100	2	1010100100000	4
302	100101110	0001000010100	3	0100010100100	3	0010010100000	3	1010000000100	3	1010100100000	5
303	100101111	0001000010100	4	0100010100100	4	0010010100000	4	1010000000100	4	1000100100000	1
304	100110000	0001000010100	5	0100010100100	5	0010010100000	5	1010000000100	5	1000100100000	2
305	100110001	0001000100000	1	0010101000100	1	0101010100000	1	1001000000100	1	1000100100000	3
306	100110010	0001000100000	2	0010101000100	2	0101010100000	2	1001000000100	2	1000100100000	4
307	100110011	0001000100000	3	0010101000100	3	0101010100000	3	1001000000100	3	1000100100000	5
308	100110100	0001000100000	4	0010101000100	4	0101010100000	4	1001000000100	4	1010000100000	1
309	100110101	0001000100000	5	0010101000100	5	0101010100000	5	1001000000100	5	1010000100000	2
310	100110110	0001000100010	1	0010000000100	1	0100100100000	1	1000100000100	1	1010000100000	3
311	100110111	0001000100010	2	0010000000100	2	0100100100000	2	1000100000100	2	1010000100000	4
312	100111000	0001000100010	3	0010000000100	3	0100100100000	3	1000100000100	3	1010000100000	5
313	100111001	0001000100010	4	0010000000100	4	0100100100000	4	1000100000100	4	1010010100000	1
314	100111010	0001000100010	5	0010000000100	5	0100100100000	5	1000100000100	5	1010010100000	2
315	100111011	0001000100100	1	0100100000100	1	0100010100000	1	1010000010100	1	1010010100000	3
316	100111100	0001000100100	2	0100100000100	2	0100010100000	2	1010000010100	2	1010010100000	4
317	100111101	0001000100100	3	0100100000100	3	0100010100000	3	1010000010100	3	1010010100000	5
318	100111110	0001000100100	4	0100100000100	4	0100010100000	4	1010000010100	4	1001001000000	1
319	100111111	0001000100100	5	0100100000100	5	0100010100000	5	1010000010100	5	1001001000000	2

FIG. 4F

	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
320	101000000	0001000101000	1	0010010010100	1	0001010100000	1	1000010000100	1	1001001000000	3
321	101000001	0001000101000	2	0010010010100	2	0001010100000	2	1000010000100	2	1001001000000	4
322	101000010	0001000101000	3	0010010010100	3	0001010100000	3	1000010000100	3	1001001000000	5
323	101000011	0001000101000	4	0010010010100	4	0001010100000	4	1000010000100	4	1000101000000	1
324	101000100	0001000101000	5	0010010010100	5	0001010100000	5	1000010000100	5	1000101000000	2
325	101000101	0001000101010	1	0010101010100	1	0100000100000	1	1010000100100	1	1000101000000	3
326	101000110	0001000101010	2	0010101010100	2	0100000100000	2	1010000100100	2	1000101000000	4
327	101000111	0001000101010	3	0010101010100	3	0100000100000	3	1010000100100	3	1000101000000	5
328	101001000	0001000101010	4	0010101010100	4	0100000100000	4	1010000100100	4	1010101000000	1
329	101001001	0001000101010	5	0010101010100	5	0100000100000	5	1010000100100	5	1010101000000	2
330	101001010	0001001000000	1	0100100010100	1	0101001000000	1	1001000010100	1	1010101000000	3
331	101001011	0001001000000	2	0100100010100	2	0101001000000	2	1001000010100	2	1010101000000	4
332	101001100	0001001000000	3	0100100010100	3	0101001000000	3	1001000010100	3	1010101000000	5
333	101001101	0001001000000	4	0100100010100	4	0101001000000	4	1001000010100	4	1010001000000	1
334	101001110	0001001000000	5	0100100010100	5	0101001000000	5	1001000010100	5	1010001000000	2
335	101001111	0001001000010	1	0001010100100	1	0100101000000	1	1000001000100	1	1010001000000	3
336	101010000	0001001000010	2	0001010100100	2	0100101000000	2	1000001000100	2	1010001000000	4
337	101010001	0001001000010	3	0001010100100	3	0100101000000	3	1000001000100	3	1010001000000	5
338	101010010	0001001000010	4	0001010100100	4	0100101000000	4	1000001000100	4	1000001000000	1
339	101010011	0001001000010	5	0001010100100	5	0100101000000	5	1000001000100	5	1000001000000	2
340	101010100	0001001000100	1	0100100100100	1	0010001000000	1	1010001000100	1	1000001000000	3
341	101010101	0001001000100	2	0100100100100	2	0010001000000	2	1010001000100	2	1000001000000	4
342	101010110	0001001000100	3	0100100100100	3	0010001000000	3	1010001000100	3	1000001000000	5
343	101010111	0001001000100	4	0100100100100	4	0010001000000	4	1010001000100	4	1010010000000	1
344	101011000	0001001000100	5	0100100100100	5	0010001000000	5	1010001000100	5	1010010000000	2
345	101011001	0001001001000	1	0100000000100	1	0100001000000	1	1001000100100	1	1010010000000	3
346	101011010	0001001001000	2	0100000000100	2	0100001000000	2	1001000100100	2	1010010000000	4
347	101011011	0001001001000	3	0100000000100	3	0100001000000	3	1001000100100	3	1010010000000	5
348	101011100	0001001001000	4	0100000000100	4	0100001000000	4	1001000100100	4	1000010000000	1
349	101011101	0001001001000	5	0100000000100	5	0100001000000	5	1001000100100	5	1000010000000	2
350	101011110	0001001001010	1	0010010100100	1	0010101000000	1	1000100010100	1	1000010000000	3
351	101011111	0001001001010	2	0010010100100	2	0010101000000	2	1000100010100	2	1000010000000	4
352	101100000	0001001001010	3	0010010100100	3	0010101000000	3	1000100010100	3	1000010000000	5
353	101100001	0001001001010	4	0010010100100	4	0010101000000	4	1000100010100	4	1001010000000	1
354	101100010	0001001001010	5	0010010100100	5	0010101000000	5	1000100010100	5	1001010000000	2
355	101100011	0001001010000	1	0100101000100	1	0010010000000	1	1010001010100	1	1001010000000	3
356	101100100	0001001010000	2	0100101000100	2	0010010000000	2	1010001010100	2	1001010000000	4
357	101100101	0001001010000	3	0100101000100	3	0010010000000	3	1010001010100	3	1001010000000	5
358	101100110	0001001010000	4	0100101000100	4	0010010000000	4	1010001010100	4	1000100000000	1
359	101100111	0001001010000	5	0100101000100	5	0010010000000	5	1010001010100	5	1000100000000	2
360	101101000	0001001010010	1	0010001000100	1	0100010000000	1	1000000100100	1	1000100000000	3
361	101101001	0001001010010	2	0010001000100	2	0100010000000	2	1000000100100	2	1000100000000	4
362	101101010	0001001010010	3	0010001000100	3	0100010000000	3	1000000100100	3	1000100000000	5
363	101101011	0001001010010	4	0010001000100	4	0100010000000	4	1000000100100	4	1010100000000	1
364	101101100	0001001010010	5	0010001000100	5	0100010000000	5	1000000100100	5	1010100000000	2
365	101101101	0001001010100	1	0100000010100	1	0101010000000	1	1010010000100	1	1010100000000	3
366	101101110	0001001010100	2	0100000010100	2	0101010000000	2	1010010000100	2	1010100000000	4
367	101101111	0001001010100	3	0100000010100	3	0101010000000	3	1010010000100	3	1010100000000	5
368	101110000	0001001010100	4	0100000010100	4	0101010000000	4	1010010000100	4	1001000000000	1
369	101110001	0001001010100	5	0100000010100	5	0101010000000	5	1010010000100	5	1001000000000	2
370	101110010	0001010000000	1	0100101010100	1	0100100000000	1	1001001000100	1	1001000000000	3
371	101110011	0001010000000	2	0100101010100	2	0100100000000	2	1001001000100	2	1001000000000	4
372	101110100	0001010000000	3	0100101010100	3	0100100000000	3	1001001000100	3	1001000000000	5
373	101110101	0001010000000	4	0100101010100	4	0100100000000	4	1001001000100	4	1000000000000	4
374	101110110	0001010000000	5	0100101010100	5	0100100000000	5	1001001000100	5	1010000000000	2
375	101110111	0001010000010	1	0001010010100	1	0010100000000	1	1000100100100	1	1010000000000	3
376	101111000	0001010000010	2	0001010010100	2	0010100000000	2	1000100100100	2	1010000000000	4
377	101111001	0001010000010	3	0001010010100	3	0010100000000	3	1000100100100	3	1010000000000	5
378	101111010	0001010000010	4	0001010010100	4	0010100000000	4	1000100100100	4	1001001001001	1
379	101111011	0001010000010	5	0001010010100	5	0010100000000	5	1000100100100	5	1001001001001	2
380	101111100	0000000000101	1	0001001010001	1	0100000000001	1	1000000000001	1	1001001001001	3
381	101111101	0000000000101	2	0001001010001	2	0100000000001	2	1000000000001	2	1001001010001	1
382	101111110	0000000000101	3	0001001010001	3	0100000000001	3	1000000000001	3	1001001010001	2
383	101111111	0000000001001	1	0001001010101	1	0100000000101	1	1000000000101	1	1001001010001	3

FIG. 4G

	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
384	110000000	0000000001001	2	0001001010101	2	0100000000101	2	1000000000101	2	1001001010101	1
385	110000001	0000000001001	3	0001001010101	3	0100000000101	3	1000000000101	3	1001001010101	2
386	110000010	0000000010001	1	0001010000001	1	0100000001001	1	1000000001001	1	1001001010101	3
387	110000011	0000000010001	2	0001010000001	2	0100000001001	2	1000000001001	2	1001010000001	1
388	110000100	0000000010001	3	0001010000001	3	0100000001001	3	1000000001001	3	1001010000001	2
389	110000101	0000000010101	1	0001010000101	1	0100000010001	1	1000000010001	1	1001010000001	3
390	110000110	0000000010101	2	0001010000101	2	0100000010001	2	1000000010001	2	1001010000101	1
391	110000111	0000000010101	3	0001010000101	3	0100000010001	3	1000000010001	3	1001010000101	2
392	110001000	0000000100001	1	0001010001001	1	0100000010101	1	1000000010101	1	1001010000101	3
393	110001001	0000000100001	2	0001010001001	2	0100000010101	2	1000000010101	2	1001010001001	1
394	110001010	0000000100001	3	0001010001001	3	0100000010101	3	1000000010101	3	1001010001001	2
395	110001011	0000000100101	1	0001010010001	1	0100000100001	1	1000000100001	1	1001010001001	3
396	110001100	0000000100101	2	0001010010001	2	0100000100001	2	1000000100001	2	1001010010001	1
397	110001101	0000000100101	3	0001010010001	3	0100000100001	3	1000000100001	3	1001010010001	2
398	110001110	0000000101001	1	0001010010101	1	0100000100101	1	1000000100101	1	1001010010001	3
399	110001111	0000000101001	2	0001010010101	2	0100000100101	2	1000000100101	2	1001010010101	1
400	110010000	0000000101001	3	0001010010101	3	0100000100101	3	1000000100101	3	1001010010101	2
401	110010001	0000001000001	1	0001010100001	1	0100000101001	1	1000000101001	1	1001010010101	3
402	110010010	0000001000001	2	0001010100001	2	0100000101001	2	1000000101001	2	1001010100001	1
403	110010011	0000001000001	3	0001010100001	3	0100000101001	3	1000000101001	3	1001010100001	2
404	110010100	0000001000101	1	0001010100101	1	0100001000001	1	1000001000001	1	1001010100001	3
405	110010101	0000001000101	2	0001010100101	2	0100001000001	2	1000001000001	2	1001010100101	1
406	110010110	0000001000101	3	0001010100101	3	0100001000001	3	1000001000001	3	1001010100101	2
407	110010111	0000001001001	1	0001010101001	1	0100001000101	1	1000001000101	1	1001010100101	3
408	110011000	0000001001001	2	0001010101001	2	0100001000101	2	1000001000101	2	1001010101001	1
409	110011001	0000001001001	3	0001010101001	3	0100001000101	3	1000001000101	3	1001010101001	2
410	110011010	0000001010001	1	0010000000001	1	0100001001001	1	1000001001001	1	1001010101001	3
411	110011011	0000001010001	2	0010000000001	2	0100001001001	2	1000001001001	2	1010000000001	1
412	110011100	0000001010001	3	0010000000001	3	0100001001001	3	1000001001001	3	1010000000001	2
413	110011101	0000001010101	1	0010000000101	1	0100001010001	1	1000001010001	1	1010000000001	3
414	110011110	0000001010101	2	0010000000101	2	0100001010001	2	1000001010001	2	1010000000101	1
415	110011111	0000001010101	3	0010000000101	3	0100001010001	3	1000001010001	3	1010000000101	2
416	110100000	0000010000001	1	0010000001001	1	0100001010101	1	1000001010101	1	1010000000101	3
417	110100001	0000010000001	2	0010000001001	2	0100001010101	2	1000001010101	2	1010000001001	1
418	110100010	0000010000001	3	0010000001001	3	0100001010101	3	1000001010101	3	1010000001001	2
419	110100011	0000010000101	1	0010000010001	1	0100010000001	1	1000010000001	1	1010000001001	3
420	110100100	0000010000101	2	0010000010001	2	0100010000001	2	1000010000001	2	1010000010001	1
421	110100101	0000010000101	3	0010000010001	3	0100010000001	3	1000010000001	3	1010000010001	2
422	110100110	0000010001001	1	0010000010101	1	0100010000101	1	1000010000101	1	1010000010001	3
423	110100111	0000010001001	2	0010000010101	2	0100010000101	2	1000010000101	2	1010000010101	1
424	110101000	0000010001001	3	0010000010101	3	0100010000101	3	1000010000101	3	1010000010101	2
425	110101001	0000010010001	1	0010000100001	1	0100010001001	1	1000010001001	1	1010000010101	3
426	110101010	0000010010001	2	0010000100001	2	0100010001001	2	1000010001001	2	1010000100001	1
427	110101011	0000010010001	3	0010000100001	3	0100010001001	3	1000010001001	3	1010000100001	2
428	110101100	0000010010101	1	0010000100101	1	0100010010001	1	1000010010001	1	1010000100001	3
429	110101101	0000010010101	2	0010000100101	2	0100010010001	2	1000010010001	2	1010000100101	1
430	110101110	0000010010101	3	0010000100101	3	0100010010001	3	1000010010001	3	1010000100101	2
431	110101111	0000010100001	1	0010000101001	1	0100010010101	1	1000010010101	1	1010000100101	3
432	110110000	0000010100001	2	0010000101001	2	0100010010101	2	1000010010101	2	1010000101001	1
433	110110001	0000010100001	3	0010000101001	3	0100010010101	3	1000010010101	3	1010000101001	2
434	110110010	0000010100101	1	0010001000001	1	0100010100001	1	1000010100001	1	1010000101001	3
435	110110011	0000010100101	2	0010001000001	2	0100010100001	2	1000010100001	2	1010001000001	1
436	110110100	0000010100101	3	0010001000001	3	0100010100001	3	1000010100001	3	1010001000001	2
437	110110101	0000010101001	1	0010001000101	1	0100010100101	1	1000010100101	1	1010001000001	3
438	110110110	0000010101001	2	0010001000101	2	0100010100101	2	1000010100101	2	1010001000101	1
439	110110111	0000010101001	3	0010001000101	3	0100010100101	3	1000010100101	3	1010001000101	2
440	110111000	0001000000001	1	0010001001001	1	0100010101001	1	1000010101001	1	1010001000101	3
441	110111001	0001000000001	2	0010001001001	2	0100010101001	2	1000010101001	2	1010001001001	1
442	110111010	0001000000001	3	0010001001001	3	0100010101001	3	1000010101001	3	1010001001001	2
443	110111011	0001000000101	1	0010001010001	1	0100100000001	1	1000100000001	1	1010001001001	3
444	110111100	0001000000101	2	0010001010001	2	0100100000001	2	1000100000001	2	1010001010001	1
445	110111101	0001000000101	3	0010001010001	3	0100100000001	3	1000100000001	3	1010001010001	2
446	110111110	0001000001001	1	0010001010101	1	0100100000101	1	1000100000101	1	1010001010001	3
447	110111111	0001000001001	2	0010001010101	2	0100100000101	2	1000100000101	2	1010001010101	1

FIG. 4H

	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
448	111000000	0000100001001	3	0010001010101	3	0100100000101	3	1000100000101	3	1010001010101	2
449	111000001	0000100010001	1	0010010000001	1	0100100001001	1	1000100001001	1	1010001010101	3
450	111000010	0000100010001	2	0010010000001	2	0100100001001	2	1000100001001	2	1010010000001	1
451	111000011	0000100010001	3	0010010000001	3	0100100001001	3	1000100001001	3	1010010000001	2
452	111000100	0000100010101	1	0010010000101	1	0100100010001	1	1000100010001	1	1010010000001	3
453	111000101	0000100010101	2	0010010000101	2	0100100010001	2	1000100010001	2	1010010000101	1
454	111000110	0000100010101	3	0010010000101	3	0100100010001	3	1000100010001	3	1010010000101	2
455	111000111	0000100100001	1	0010010001001	1	0100100010101	1	1000100010101	1	1010010000101	3
456	111001000	0000100100001	2	0010010001001	2	0100100010101	2	1000100010101	2	1010010001001	1
457	111001001	0000100100001	3	0010010001001	3	0100100010101	3	1000100010101	3	1010010001001	2
458	111001010	0000100100101	1	0010010010001	1	0100100100001	1	1000100100001	1	1010010001001	3
459	111001011	0000100100101	2	0010010010001	2	0100100100001	2	1000100100001	2	1010010010001	1
460	111001100	0000100100101	3	0010010010001	3	0100100100001	3	1000100100001	3	1010010010001	2
461	111001101	0000100101001	1	0010010010101	1	0100100100101	1	1000100100101	1	1010010010001	3
462	111001110	0000100101001	2	0010010010101	2	0100100100101	2	1000100100101	2	1010010010101	1
463	111001111	0000100101001	3	0010010010101	3	0100100100101	3	1000100100101	3	1010010010101	2
464	111010000	0000101000001	1	0010010100001	1	0100100101001	1	1000100101001	1	1010010010101	3
465	111010001	0000101000001	2	0010010100001	2	0100100101001	2	1000100101001	2	1010010100001	1
466	111010010	0000101000001	3	0010010100001	3	0100100101001	3	1000100101001	3	1010010100001	2
467	111010011	0000101000101	1	0010010100101	1	0100101000001	1	1000101000001	1	1010010100001	3
468	111010100	0000101000101	2	0010010100101	2	0100101000001	2	1000101000001	2	1010010100101	1
469	111010101	0000101000101	3	0010010100101	3	0100101000001	3	1000101000001	3	1010010100101	2
470	111010110	0000101001001	1	0010010101001	1	0100101000101	1	1000101000101	1	1010010100101	3
471	111010111	0000101001001	2	0010010101001	2	0100101000101	2	1000101000101	2	1010010101001	1
472	111011000	0000101001001	3	0010010101001	3	0100101000101	3	1000101000101	3	1010010101001	2
473	111011001	0000101010001	1	0010100000001	1	0100101001001	1	1000101001001	1	1010010101001	3
474	111011010	0000101010001	2	0010100000001	2	0100101001001	2	1000101001001	2	1010100000001	1
475	111011011	0000101010001	3	0010100000001	3	0100101001001	3	1000101001001	3	1010100000001	2
476	111011100	0000101010101	1	0010100000101	1	0100101010001	1	1000101010001	1	1010100000001	3
477	111011101	0000101010101	2	0010100000101	2	0100101010001	2	1000101010001	2	1010100000101	1
478	111011110	0000101010101	3	0010100000101	3	0100101010001	3	1000101010001	3	1010100000101	2
479	111011111	0001000000001	1	0010100001001	1	0100101010101	1	1000101010101	1	1010100000101	3
480	111100000	0001000000001	2	0010100001001	2	0100101010101	2	1000101010101	2	1010100001001	1
481	111100001	0001000000001	3	0010100001001	3	0100101010101	3	1000101010101	3	1010100001001	2
482	111100010	0001000000101	1	0010100010001	1	0101000000001	1	1001000000001	1	1010100001001	3
483	111100011	0001000000101	2	0010100010001	2	0101000000001	2	1001000000001	2	1010100010001	1
484	111100100	0001000000101	3	0010100010001	3	0101000000001	3	1001000000001	3	1010100010001	2
485	111100101	0001000001001	1	0010100010101	1	0101000000101	1	1001000000101	1	1010100010001	3
486	111100110	0001000001001	2	0010100010101	2	0101000000101	2	1001000000101	2	1010100010101	1
487	111100111	0001000001001	3	0010100010101	3	0101000000101	3	1001000000101	3	1010100010101	2
488	111101000	0001000010001	1	0010100100001	1	0101000001001	1	1001000001001	1	1010100010101	3
489	111101001	0001000010001	2	0010100100001	2	0101000001001	2	1001000001001	2	1010100100001	1
490	111101010	0001000010001	3	0010100100001	3	0101000001001	3	1001000001001	3	1010100100001	2
491	111101011	0001000010101	1	0010100100101	1	0101000010001	1	1001000010001	1	1010100100001	3
492	111101100	0001000010101	2	0010100100101	2	0101000010001	2	1001000010001	2	1010100100101	1
493	111101101	0001000010101	3	0010100100101	3	0101000010001	3	1001000010001	3	1010100100101	2
494	111101110	0001000100001	1	0010100101001	1	0101000010101	1	1001000010101	1	1010100100101	3
495	111101111	0001000100001	2	0010100101001	2	0101000010101	2	1001000010101	2	1010100101001	1
496	111110000	0001000100001	3	0010100101001	3	0101000010101	3	1001000010101	3	1010100101001	2
497	111110001	0001000100101	1	0010101000001	1	0101000100001	1	1001000100001	1	1010100101001	3
498	111110010	0001000100101	2	0010101000001	2	0101000100001	2	1001000100001	2	1010101000001	1
499	111110011	0001000100101	3	0010101000001	3	0101000100001	3	1001000100001	3	1010101000001	2
500	111110100	0001000101001	1	0010101000101	1	0101000100101	1	1001000100101	1	1010101000001	3
501	111110101	0001000101001	2	0010101000101	2	0101000100101	2	1001000100101	2	1010101000101	1
502	111110110	0001000101001	3	0010101000101	3	0101000100101	3	1001000100101	3	1010101000101	2
503	111110111	0001001000001	1	0010101001001	1	0101000101001	1	1001000101001	1	1010101000101	3
504	111111000	0001001000001	2	0010101001001	2	0101000101001	2	1001000101001	2	1010101001001	1
505	111111001	0001001000001	3	0010101001001	3	0101000101001	3	1001000101001	3	1010101001001	2
506	111111010	0001001000101	1	0010101010001	1	0101001000001	1	1001001000001	1	1010101001001	3
507	111111011	0001001000101	2	0010101010001	2	0101001000001	2	1001001000001	2	1010101010001	1
508	111111100	0001001000101	3	0010101010001	3	0101001000001	3	1001001000001	3	1010101010001	2
509	111111101	0001001001001	1	0010101010101	1	0101001000101	1	1001001000101	1	1010101010001	3
510	111111110	0001001001001	2	0010101010101	2	0101001000101	2	1001001000101	2	1010101010101	1
511	111111111	0001001001001	3	0010101010101	3	0101001000101	3	1001001000101	3	1010101010101	2

FIG. 5

INFORMATION WORDS (DECIMAL NOTATION)	STATE	CODE WORDS	NEXT STATE
000000001 (1)	S1	0000000000100	S2
000000011 (3)	S2	0001010001010	S4
000000101 (5)	S4	0101001001001	S1
000001100 (12)	S1	0000000001010	S3
000010011 (19)	S3	0101000010100	S5

FIG. 6

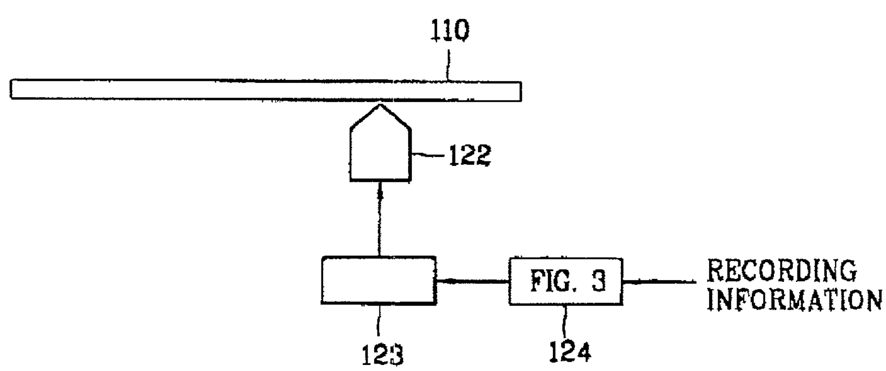

FIG. 7

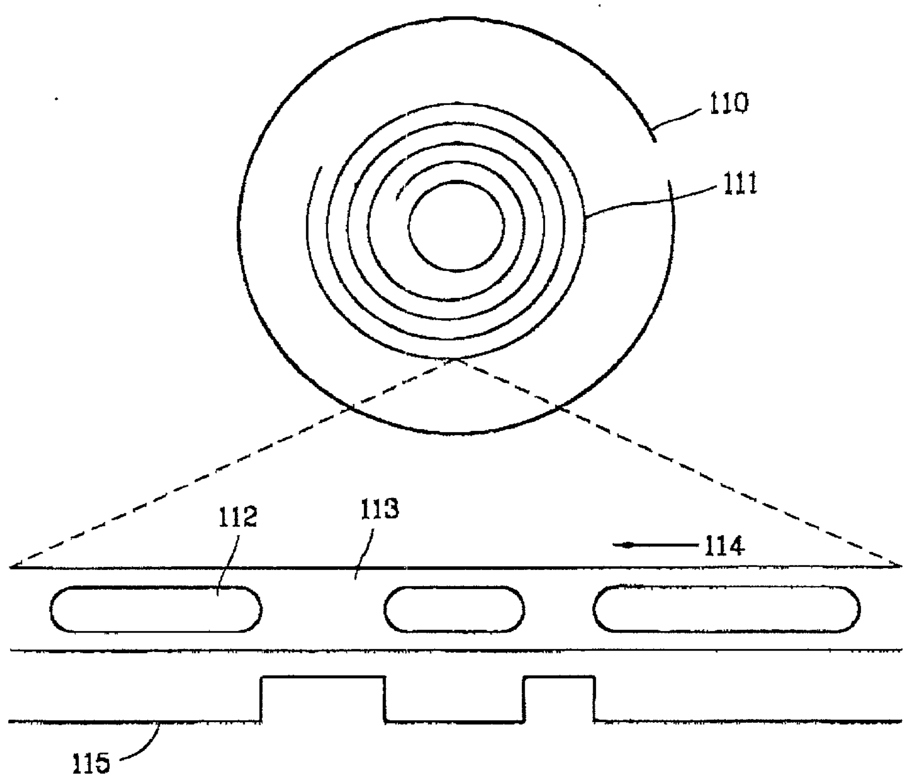

FIG. 8

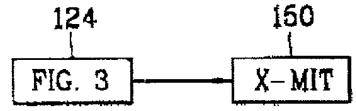

FIG. 9

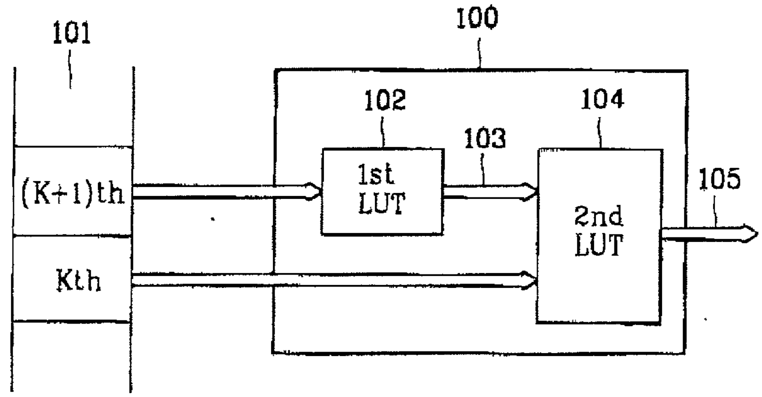

FIG. 10

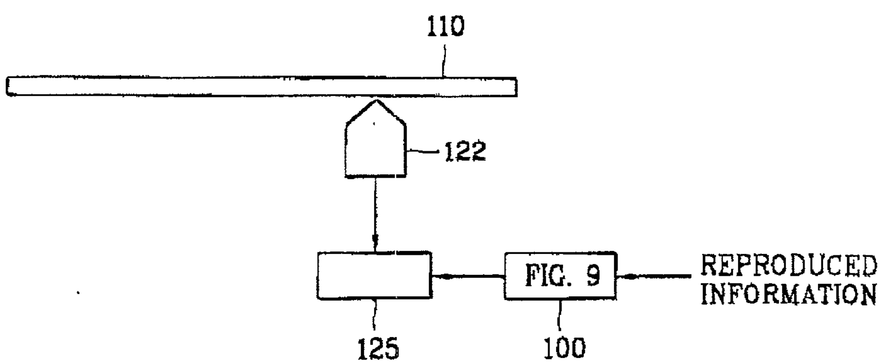

FIG. 11

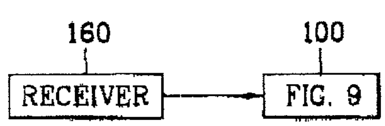

FIG. 12

SUBGROUP	STATE 1	STATE 2	STATE 3	STATE 4	STATE 5	STATE 6	STATE 7	STATE 8	STATE 9	STATE 10	STATE 11	STATE 12	STATE 13
	1st KIND								2nd KIND				
E00	24	32	32	32	32	24	32	20	0	0	0	0	0
E01	25	12	12	12	12	25	12	33	0	0	0	0	0
E10	0	0	0	0	0	0	0	0	24	24	24	32	39
E11	0	0	0	0	0	0	0	0	25	25	25	12	2

FIG. 13A

	State 1		State 2		State 3		State 4		State 5		State 6		State 7		State 8		State 9		State 10		State 11		State 12		State 13	
Data	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
0	00000000001000	1	00000100001010	1	00010101001000	1	01001010000010	1	01001000000100	1	00100001000100	1	01010100001000	1	00100000000000	52	10000000000010	3	10010000100010	1	10100100001010	1	10100100100100	1	10010000001000	1
1	00000000001000	2	00000100001010	2	00010101001000	2	01001010000010	2	01001000000100	2	00100001000100	2	01010100001000	2	00000100000000	2	10000000000010	2	10010000100010	2	10100100001010	2	10100100100100	2	10010000001000	2
2	00000000001000	3	00000100001010	3	00010101001000	3	01001010000010	3	01001000000100	3	00100001000100	3	01010100001000	3	00000100000000	2	10000000000010	3	10010000100010	3	10100100001010	3	10100100100100	3	10010000001000	3
3	00000000001000	4	00000100001010	4	00010101001000	4	01001010000010	4	01001000000100	4	00100001000100	4	01010100001000	4	00000100000000	4	10000000000010	4	10010000100010	4	10100100001010	4	10100100100100	4	10010000001000	4
4	00000000001000	5	00000100001010	5	00010101001000	5	01001010000010	5	01001000000100	5	00100001000100	5	01010100001000	5	00000100000000	5	10000000000010	5	10010000100010	5	10100100001010	5	10100100100100	5	10010000001000	5
5	00000000001000	6	00000100001010	6	00010101001000	6	01001010000010	6	01001000000100	6	00100001000100	6	01010100001000	6	00000100000000	6	10000000000010	6	10010000100010	6	10100100001010	6	10100100100100	6	10010000001000	6
6	00000000001000	7	00000100001010	7	00010101001000	7	01001010000010	7	01001000000100	7	00100001000100	7	01010100001000	7	00000100000000	7	10000000000010	7	10010000100010	7	10100100001010	7	10100100100100	7	10010000001000	7
7	00000000001000	8	00000100001010	8	00010101001000	8	01001010000010	8	01001000000100	8	00100001000100	8	01010100001000	8	00000100000000	8	10000000000010	8	10010000100010	8	10100100001010	8	10100100100100	8	10010000001000	8
8	00000000001000	9	00000100001010	9	00010101001000	9	01001010000010	9	01001000000100	9	00100001000100	9	01010100001000	9	00000100000000	9	10000000000010	9	10010000100010	9	10100100001010	9	10100100100100	9	10010000001000	9
9	00000000001000	10	00000100001010	10	00010101001000	10	01001010000010	10	01001000000100	10	00100001000100	10	01010100001000	10	00000100000000	10	10000000000010	10	10010000100010	10	10100100001010	10	10100100100100	10	10010000001000	10
10	00000000001000	11	00000100001010	11	00010101001000	11	01001010000010	11	01001000000100	11	00100001000100	11	01010100001000	11	00000100000000	11	10000000000010	11	10010000100010	11	10100100001010	11	10100100100100	11	10010000001000	11
11	00000000001000	12	00000100001010	12	00010101001000	12	01001010000010	12	01001000000100	12	00100001000100	12	01010100001000	12	00000100000000	12	10000000000010	12	10010000100010	12	10100100001010	12	10100100100100	12	10010000001000	12
12	00000000001000	13	00000100001010	13	00010101001000	13	01001010000010	13	01001000000100	13	00100001000100	13	01010100001000	13	00000100000000	13	10000000000010	13	10010000100010	13	10100100001010	13	10100100100100	13	10010000001000	13
13	00000000001010	1	00000100100010	1	00010000101000	1	01001010010010	1	00010000010100	1	01000010001000	1	00010000001000	1	00000101000000	1	10000000001010	1	10010001010010	1	10100100010010	1	10000100100100	1	10000010001000	1
14	00000000001010	2	00000100100010	2	00010000101000	2	01001010010010	2	00010000010100	2	01000010001000	2	00010000001000	2	00000101000000	2	10000000001010	2	10010001010010	2	10100100010010	2	10000100100100	2	10000010001000	2
15	00000000001010	3	00000100100010	3	00010000101000	3	01001010010010	3	00010000010100	3	01000010001000	3	00010000001000	3	00000101000000	3	10000000001010	3	10010001010010	3	10100100010010	3	10000100100100	3	10000010001000	3
16	00000000001010	4	00000100100010	4	00010000101000	4	01001010010010	4	00010000010100	4	01000010001000	4	00010000001000	4	00000101000000	4	10000000001010	4	10010001010010	4	10100100010010	4	10000100100100	4	10000010001000	4
17	00000000001010	5	00000100100010	5	00010000101000	5	01001010010010	5	00010000010100	5	01000010001000	5	00010000001000	5	00000101000000	5	10000000001010	5	10010001010010	5	10100100010010	5	10000100100100	5	10000010001000	5
18	00000000001010	6	00000100100010	6	00010000101000	6	01001010010010	6	00010000010100	6	01000010001000	6	00010000001000	6	00000101000000	6	10000000001010	6	10010001010010	6	10100100010010	6	10000100100100	6	10000010001000	6
19	00000000001010	7	00000100100010	7	00010000101000	7	01001010010010	7	00010000010100	7	01000010001000	7	00010000001000	7	00000101000000	7	10000000001010	7	10010001010010	7	10100100010010	7	10000100100100	7	10000010001000	7

FIG. 13B

Data	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
291	[illegible]	3	[illegible]	6	[illegible]	5	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6
292	[illegible]	4	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7
293	[illegible]	5	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8
294	[illegible]	6	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9
295	[illegible]	7	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10
296	[illegible]	8	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11
297	[illegible]	1	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12
298	[illegible]	2	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13
299	[illegible]	3	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1
300	[illegible]	4	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2
301	[illegible]	5	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3
302	[illegible]	6	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4
303	[illegible]	7	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5
304	[illegible]	8	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6
305	[illegible]	1	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7
306	[illegible]	2	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	6	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8
307	[illegible]	3	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9
308	[illegible]	4	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	2	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10
309	[illegible]	5	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	3	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11
310	[illegible]	6	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12
311	[illegible]	7	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13
312	[illegible]	8	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1

FIG. 13C

Data	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
494	[illegible]	6	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	6	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7
495	[illegible]	7	[illegible]	6	[illegible]	6	[illegible]	8	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	5	[illegible]	8	[illegible]	6	[illegible]	8	[illegible]	8	[illegible]	10
496	[illegible]	8	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	3
497	[illegible]	1	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	4
498	[illegible]	2	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	5
499	[illegible]	3	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	1	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	6
500	[illegible]	4	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	2	[illegible]	5	[illegible]	6	[illegible]	5	[illegible]	5	[illegible]	11
501	[illegible]	5	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	3	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	12
502	[illegible]	6	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	4	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	9
503	[illegible]	7	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	5	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	10
504	[illegible]	8	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	11
505	[illegible]	1	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	12
506	[illegible]	2	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	13
507	[illegible]	3	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	1	[illegible]	4	[illegible]	4	[illegible]	1	[illegible]	4	[illegible]	1
508	[illegible]	4	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	2	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	2
509	[illegible]	5	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	3	[illegible]	5	[illegible]	6	[illegible]	5	[illegible]	6	[illegible]	3
510	[illegible]	6	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	4	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	4
511	[illegible]	7	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	5	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	5

FIG. 14

	1st KIND								2nd KIND				
SUBGROUP	STATE 1	STATE 2	STATE 3	STATE 4	STATE 5	STATE 6	STATE 7	STATE 8	STATE 9	STATE 10	STATE 11	STATE 12	STATE 13
E00	114	114	114	114	113	113	114	114	0	0	0	0	0
E01	71	71	71	71	72	72	71	71	0	0	0	0	0
E10	0	0	0	0	0	0	0	0	112	113	112	112	112
E11	0	0	0	0	0	0	0	0	75	74	75	75	75

FIG. 15A

Data	State 1 Channel bits	state	State 2 Channel bits	state	State 3 Channel bits	state	State 4 Channel bits	state	State 5 Channel bits	state	State 6 Channel bits	state	State 7 Channel bits	state	State 8 Channel bits	state	State 9 Channel bits	state	State 10 Channel bits	state	State 11 Channel bits	state	State 12 Channel bits	state	State 13 Channel bits	state
0	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	3	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	3	[illegible]	1	[illegible]	1	[illegible]	1
1	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2
2	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3
3	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4
4	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5
5	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6
6	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7
7	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8
8	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	1	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	9
9	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	2	[illegible]	10	[illegible]	10
10	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	3	[illegible]	11	[illegible]	11
11	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	4	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	12
12	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	5	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	13
13	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	6	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	1
14	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	7	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	2
15	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	8	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	3
16	[illegible]	9	[illegible]	4	[illegible]	1	[illegible]	4	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	9	[illegible]	4	[illegible]	4
17	[illegible]	10	[illegible]	5	[illegible]	2	[illegible]	5	[illegible]	2	[illegible]	10	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	5
18	[illegible]	11	[illegible]	6	[illegible]	3	[illegible]	6	[illegible]	3	[illegible]	11	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	6
19	[illegible]	12	[illegible]	7	[illegible]	4	[illegible]	7	[illegible]	4	[illegible]	12	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	7
20	[illegible]	13	[illegible]	8	[illegible]	5	[illegible]	8	[illegible]	5	[illegible]	13	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	8
21	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	9	[illegible]	1	[illegible]	1	[illegible]	9
22	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	10
23	[illegible]	3	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	11
24	[illegible]	4	[illegible]	4	[illegible]	9	[illegible]	4	[illegible]	9	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	4	[illegible]	12
25	[illegible]	5	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	6	[illegible]	13
26	[illegible]	6	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	6	[illegible]	1
27	[illegible]	7	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	7	[illegible]	1
28	[illegible]	8	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	8	[illegible]	3
29	[illegible]	9	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	1	[illegible]	4	[illegible]	4	[illegible]	9	[illegible]	4	[illegible]	1	[illegible]	9	[illegible]	4
30	[illegible]	10	[illegible]	10	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	5	[illegible]	10	[illegible]	10	[illegible]	5	[illegible]	2	[illegible]	10	[illegible]	5
31	[illegible]	11	[illegible]	11	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	6	[illegible]	11	[illegible]	11	[illegible]	6	[illegible]	3	[illegible]	11	[illegible]	6

FIG. 15B

Data	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
575	[illegible]	5	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5
576	[illegible]	6	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6
577	[illegible]	7	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7
578	[illegible]	8	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	2	[illegible]	6	[illegible]	8
579	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	1	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	9
580	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	2	[illegible]	10	[illegible]	10
581	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	3	[illegible]	11	[illegible]	11
582	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	4	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	12
583	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	5	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	13
584	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	6	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	1
585	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	7	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	2
586	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	8	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	3
587	[illegible]	9	[illegible]	4	[illegible]	1	[illegible]	4	[illegible]	1	[illegible]	1	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	1	[illegible]	4	[illegible]	1
588	[illegible]	10	[illegible]	5	[illegible]	2	[illegible]	5	[illegible]	2	[illegible]	2	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	2	[illegible]	5	[illegible]	5
589	[illegible]	11	[illegible]	6	[illegible]	3	[illegible]	6	[illegible]	3	[illegible]	3	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	3	[illegible]	6	[illegible]	6
590	[illegible]	12	[illegible]	7	[illegible]	4	[illegible]	7	[illegible]	4	[illegible]	4	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	4	[illegible]	7	[illegible]	7
591	[illegible]	13	[illegible]	8	[illegible]	5	[illegible]	8	[illegible]	5	[illegible]	5	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	5	[illegible]	8	[illegible]	8
592	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	1	[illegible]	9
593	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	10
594	[illegible]	3	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	11
595	[illegible]	4	[illegible]	4	[illegible]	9	[illegible]	4	[illegible]	9	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	4	[illegible]	12
596	[illegible]	5	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	5	[illegible]	13
597	[illegible]	6	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	6	[illegible]	1
598	[illegible]	7	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	7	[illegible]	2
599	[illegible]	8	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	8	[illegible]	3	[illegible]	8	[illegible]	8	[illegible]	3
600	[illegible]	9	[illegible]	9	[illegible]	1	[illegible]	9	[illegible]	1	[illegible]	1	[illegible]	4	[illegible]	9	[illegible]	9	[illegible]	4	[illegible]	1	[illegible]	9	[illegible]	4
601	[illegible]	10	[illegible]	10	[illegible]	2	[illegible]	10	[illegible]	2	[illegible]	2	[illegible]	5	[illegible]	10	[illegible]	10	[illegible]	5	[illegible]	2	[illegible]	10	[illegible]	5
602	[illegible]	11	[illegible]	11	[illegible]	3	[illegible]	11	[illegible]	3	[illegible]	3	[illegible]	6	[illegible]	11	[illegible]	11	[illegible]	6	[illegible]	3	[illegible]	11	[illegible]	6
603	[illegible]	12	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	4	[illegible]	7	[illegible]	12	[illegible]	12	[illegible]	7	[illegible]	4	[illegible]	12	[illegible]	7
604	[illegible]	13	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	5	[illegible]	5	[illegible]	8	[illegible]	13	[illegible]	13	[illegible]	8	[illegible]	5	[illegible]	13	[illegible]	8
605	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	6	[illegible]	6	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	1	[illegible]	6	[illegible]	1	[illegible]	1
606	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	7	[illegible]	7	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	2

FIG. 15C

bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
2016	[illegible]	7	[illegible]	9	[illegible]	7	[illegible]	4	[illegible]	11	[illegible]	10	[illegible]	8	[illegible]	5	[illegible]	8	[illegible]	3	[illegible]	1	[illegible]	3	[illegible]	3
2017	[illegible]	8	[illegible]	10	[illegible]	8	[illegible]	5	[illegible]	13	[illegible]	11	[illegible]	9	[illegible]	6	[illegible]	9	[illegible]	4	[illegible]	3	[illegible]	4	[illegible]	4
2018	[illegible]	9	[illegible]	11	[illegible]	9	[illegible]	6	[illegible]	2	[illegible]	12	[illegible]	10	[illegible]	7	[illegible]	10	[illegible]	5	[illegible]	2	[illegible]	5	[illegible]	5
2019	[illegible]	10	[illegible]	12	[illegible]	10	[illegible]	7	[illegible]	3	[illegible]	13	[illegible]	11	[illegible]	8	[illegible]	11	[illegible]	6	[illegible]	3	[illegible]	6	[illegible]	6
2020	[illegible]	11	[illegible]	13	[illegible]	11	[illegible]	6	[illegible]	4	[illegible]	4	[illegible]	12	[illegible]	9	[illegible]	12	[illegible]	7	[illegible]	4	[illegible]	7	[illegible]	7
2021	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	4	[illegible]	5	[illegible]	5	[illegible]	13	[illegible]	10	[illegible]	13	[illegible]	8	[illegible]	5	[illegible]	8	[illegible]	8
2022	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	10	[illegible]	6	[illegible]	6	[illegible]	2	[illegible]	13	[illegible]	1	[illegible]	3	[illegible]	6	[illegible]	1	[illegible]	1
2023	[illegible]	2	[illegible]	6	[illegible]	2	[illegible]	11	[illegible]	7	[illegible]	7	[illegible]	1	[illegible]	12	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	2	[illegible]	2
2024	[illegible]	2	[illegible]	7	[illegible]	3	[illegible]	12	[illegible]	8	[illegible]	8	[illegible]	5	[illegible]	13	[illegible]	3	[illegible]	3	[illegible]	8	[illegible]	3	[illegible]	3
2025	[illegible]	4	[illegible]	8	[illegible]	4	[illegible]	12	[illegible]	9	[illegible]	5	[illegible]	6	[illegible]	4	[illegible]	3	[illegible]	4	[illegible]	9	[illegible]	4	[illegible]	4
2026	[illegible]	5	[illegible]	9	[illegible]	5	[illegible]	2	[illegible]	10	[illegible]	10	[illegible]	7	[illegible]	5	[illegible]	4	[illegible]	5	[illegible]	10	[illegible]	5	[illegible]	5
2027	[illegible]	6	[illegible]	10	[illegible]	6	[illegible]	3	[illegible]	11	[illegible]	4	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	11	[illegible]	6	[illegible]	6
2028	[illegible]	3	[illegible]	11	[illegible]	7	[illegible]	4	[illegible]	12	[illegible]	12	[illegible]	9	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	12	[illegible]	7	[illegible]	7
2029	[illegible]	3	[illegible]	12	[illegible]	6	[illegible]	5	[illegible]	13	[illegible]	13	[illegible]	10	[illegible]	6	[illegible]	8	[illegible]	8	[illegible]	13	[illegible]	8	[illegible]	8
2030	[illegible]	9	[illegible]	13	[illegible]	9	[illegible]	6	[illegible]	3	[illegible]	2	[illegible]	11	[illegible]	9	[illegible]	2	[illegible]	9	[illegible]	4	[illegible]	4	[illegible]	9
2031	[illegible]	10	[illegible]	2	[illegible]	13	[illegible]	7	[illegible]	4	[illegible]	3	[illegible]	12	[illegible]	10	[illegible]	3	[illegible]	13	[illegible]	5	[illegible]	5	[illegible]	10
2032	[illegible]	11	[illegible]	3	[illegible]	13	[illegible]	8	[illegible]	5	[illegible]	4	[illegible]	13	[illegible]	11	[illegible]	4	[illegible]	11	[illegible]	6	[illegible]	6	[illegible]	11
2033	[illegible]	12	[illegible]	4	[illegible]	12	[illegible]	9	[illegible]	6	[illegible]	5	[illegible]	2	[illegible]	12	[illegible]	5	[illegible]	12	[illegible]	7	[illegible]	7	[illegible]	12
2034	[illegible]	13	[illegible]	5	[illegible]	13	[illegible]	10	[illegible]	7	[illegible]	5	[illegible]	3	[illegible]	13	[illegible]	6	[illegible]	13	[illegible]	8	[illegible]	8	[illegible]	13
2035	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	11	[illegible]	8	[illegible]	7	[illegible]	4	[illegible]	2	[illegible]	7	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	1
2036	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	12	[illegible]	9	[illegible]	8	[illegible]	5	[illegible]	3	[illegible]	8	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	2
2037	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	13	[illegible]	10	[illegible]	9	[illegible]	6	[illegible]	4	[illegible]	9	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	3
2038	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	2	[illegible]	11	[illegible]	10	[illegible]	7	[illegible]	5	[illegible]	10	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	4
2039	[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	3	[illegible]	12	[illegible]	11	[illegible]	8	[illegible]	6	[illegible]	11	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	5
2040	[illegible]	11	[illegible]	11	[illegible]	11	[illegible]	4	[illegible]	13	[illegible]	12	[illegible]	9	[illegible]	7	[illegible]	12	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	6
2041	[illegible]	12	[illegible]	12	[illegible]	12	[illegible]	5	[illegible]	2	[illegible]	13	[illegible]	10	[illegible]	8	[illegible]	13	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	7
2042	[illegible]	13	[illegible]	13	[illegible]	13	[illegible]	6	[illegible]	3	[illegible]	2	[illegible]	11	[illegible]	9	[illegible]	2	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	8
2043	[illegible]	2	[illegible]	2	[illegible]	2	[illegible]	7	[illegible]	4	[illegible]	3	[illegible]	12	[illegible]	10	[illegible]	3	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	1
2044	[illegible]	3	[illegible]	3	[illegible]	3	[illegible]	8	[illegible]	5	[illegible]	4	[illegible]	13	[illegible]	11	[illegible]	4	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	2
2045	[illegible]	4	[illegible]	4	[illegible]	4	[illegible]	9	[illegible]	6	[illegible]	5	[illegible]	4	[illegible]	12	[illegible]	5	[illegible]	7	[illegible]	7	[illegible]	7	[illegible]	3
2046	[illegible]	5	[illegible]	5	[illegible]	5	[illegible]	10	[illegible]	7	[illegible]	6	[illegible]	5	[illegible]	13	[illegible]	6	[illegible]	8	[illegible]	8	[illegible]	8	[illegible]	4
2047	[illegible]	6	[illegible]	6	[illegible]	6	[illegible]	11	[illegible]	8	[illegible]	7	[illegible]	6	[illegible]	2	[illegible]	7	[illegible]	9	[illegible]	9	[illegible]	9	[illegible]	5

FIG. 16

	1st KIND			2nd KIND	
SUBGROUP	STATE 1	STATE 2	STATE 3	STATE 4	STATE 5
E00	1176	1176	1176	0	0
E01	771	771	771	0	0
E10	0	0	0	1169	1169
E11	0	0	0	782	782

FIG. 17A

	State 1		State 2		State 3		State 4		State 5	
Data	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
0	0000010000000000100	1	0010000000101001001	1	0100001010000101001	1	1000000000010000001	1	1001001001010010000	1
1	0000010000000000100	2	0010000000101001001	2	0100001010000101001	2	1000000000010000001	2	1001001001010010000	2
2	0000010000000000100	3	0010000000101001001	3	0100001010000101001	3	1000000000010000001	3	1001001001010010000	3
3	0000010000000000100	4	0010000000101001010	1	0100001010000101010	1	1000000000010000010	1	1001001001010010000	4
4	0000010000000000100	5	0010000000101001010	2	0100001010000101010	2	1000000000010000010	2	1001001001010010000	5
5	0000010000000000101	1	0010000000101001010	3	0100001010000101010	3	1000000000010000010	3	1001001001010010001	1
6	0000010000000000101	2	0010000000101001010	4	0100001010000101010	4	1000000000010000010	4	1001001001010010001	2
7	0000010000000000101	3	0010000000101001010	5	0100001010000101010	5	1000000000010000010	5	1001001001010010001	3
8	0000010000000001000	1	0010000000101010000	1	0100001010001000001	1	1000000000010000100	1	1001001001010010010	1
9	0000010000000001000	2	0010000000101010000	2	0100001010001000001	2	1000000000010000100	2	1001001001010010010	2
10	0000010000000001000	3	0010000000101010000	3	0100001010001000001	3	1000000000010000100	3	1001001001010010010	3
11	0000010000000001000	4	0010000000101010000	4	0100001010001000010	1	1000000000010000100	4	1001001001010010010	4
12	0000010000000001000	5	0010000000101010000	5	0100001010001000010	2	1000000000010000100	5	1001001001010010010	5
13	0000010000000001001	1	0010000000101010001	1	0100001010001000010	3	1000000000010000101	1	1001001001010010100	1
14	0000010000000001001	2	0010000000101010001	2	0100001010001000010	4	1000000000010000101	2	1001001001010010100	2
15	0000010000000001001	3	0010000000101010001	3	0100001010001000010	5	1000000000010000101	3	1001001001010010100	3
16	0000010000000001010	1	0010000000101010010	1	0100001010001000100	1	1000000000010001000	1	1001001001010010100	4
17	0000010000000001010	2	0010000000101010010	2	0100001010001000100	2	1000000000010001000	2	1001001001010010100	5
18	0000010000000001010	3	0010000000101010010	3	0100001010001000100	3	1000000000010001000	3	1001001001010010101	1
19	0000010000000001010	4	0010000000101010010	4	0100001010001000100	4	1000000000010001000	4	1001001001010010101	2
20	0000010000000001010	5	0010000000101010010	5	0100001010001000100	5	1000000000010001000	5	1001001001010010101	3
21	0000010000000010000	1	0010000000101010100	1	0100001010001000101	1	1000000000010001001	1	1001001001010100000	1
22	0000010000000010000	2	0010000000101010100	2	0100001010001000101	2	1000000000010001001	2	1001001001010100000	2
23	0000010000000010000	3	0010000000101010100	3	0100001010001000101	3	1000000000010001001	3	1001001001010100000	3
24	0000010000000010000	4	0010000000101010100	4	0100001010001001000	1	1000000000010001010	1	1001001001010100000	4
25	0000010000000010000	5	0010000000101010100	5	0100001010001001000	2	1000000000010001010	2	1001001001010100000	5
26	0000010000000010001	1	0010000000101010101	1	0100001010001001000	3	1000000000010001010	3	1001001001010100001	1
27	0000010000000010001	2	0010000000101010101	2	0100001010001001000	4	1000000000010001010	4	1001001001010100001	2
28	0000010000000010001	3	0010000000101010101	3	0100001010001001000	5	1000000000010001010	5	1001001001010100001	3
29	0000010000000010010	1	0010000001000000001	1	0100001010001001001	1	1000000000010010000	1	1001001001010100010	1
30	0000010000000010010	2	0010000001000000001	2	0100001010001001001	2	1000000000010010000	2	1001001001010100010	2
31	0000010000000010010	3	0010000001000000001	3	0100001010001001001	3	1000000000010010000	3	1001001001010100010	3
32	0000010000000010010	4	0010000001000000010	1	0100001010001001010	1	1000000000010010000	4	1001001001010100010	4
33	0000010000000010010	5	0010000001000000010	2	0100001010001001010	2	1000000000010010000	5	1001001001010100010	5
34	0000010000000010100	1	0010000001000000010	3	0100001010001001010	3	1000000000010010001	1	1001001001010100100	1
35	0000010000000010100	2	0010000001000000010	4	0100001010001001010	4	1000000000010010001	2	1001001001010100100	2
36	0000010000000010100	3	0010000001000000010	5	0100001010001001010	5	1000000000010010001	3	1001001001010100100	3
37	0000010000000010100	4	0010000001000000100	1	0100001010001010000	1	1000000000010010010	1	1001001001010100100	4
38	0000010000000010100	5	0010000001000000100	2	0100001010001010000	2	1000000000010010010	2	1001001001010100100	5
39	0000010000000010101	1	0010000001000000100	3	0100001010001010000	3	1000000000010010010	3	1001001001010100101	1
40	0000010000000010101	2	0010000001000000100	4	0100001010001010000	4	1000000000010010010	4	1001001001010100101	2
41	0000010000000010101	3	0010000001000000100	5	0100001010001010000	5	1000000000010010010	5	1001001001010100101	3
42	0000010000000100000	1	0010000001000000101	1	0100001010001010001	1	1000000000010010100	1	1001001001010101000	1
43	0000010000000100000	2	0010000001000000101	2	0100001010001010001	2	1000000000010010100	2	1001001001010101000	2
44	0000010000000100000	3	0010000001000000101	3	0100001010001010001	3	1000000000010010100	3	1001001001010101000	3
45	0000010000000100000	4	0010000001000001000	1	0100001010001010010	1	1000000000010010100	4	1001001001010101000	4

FIG. 17B

Data	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
1565	0000100000001000101	1	00100010010000010101	1	0100010101000001001	3	10000010000010101001	1	1001010100100001010	3
1566	0000100000001000101	2	00100010010000010101	2	0100010101000001010	1	10000010000010101001	2	1001010100100001010	4
1567	0000100000001000101	3	00100010010000010101	3	0100010101000001010	2	10000010000010101001	3	1001010100100001010	5
1568	0000100000001001000	1	001000100100010000 0	1	0100010101000001010	3	10000010000010101010	1	1001010100100010000	1
1569	0000100000001001000	2	0010001001000100000	2	0100010101000001010	4	10000010000010101010	2	1001010100100010000	2
1570	0000100000001001000	3	0010001001000100000	3	0100010101000001010	5	10000010000010101010	3	1001010100100010000	3
1571	0000100000001001000	4	0010001001000100000	4	0100010101000010000	1	10000010000010101010	4	1001010100100010000	4
1572	0000100000001001000	5	0010001001000100000	5	0100010101000010000	2	10000010000010101010	5	1001010100100010000	5
1573	0000100000001001001	1	0010001001000100001	1	0100010101000010000	3	10000010001000000001	1	1001010100100010001	1
1574	0000100000001001001	2	0010001001000100001	2	0100010101000010000	4	10000010001000000001	2	1001010100100010001	2
1575	0000100000001001001	3	0010001001000100001	3	0100010101000010000	5	10000010001000000001	3	1001010100100010001	3
1576	0000100000001001010	1	0010001001000100010	1	0100010101000010001	1	10000010001000000010	1	1001010100100010010	1
1577	0000100000001001010	2	0010001001000100010	2	0100010101000010001	2	10000010001000000010	2	1001010100100010010	2
1578	0000100000001001010	3	0010001001000100010	3	0100010101000010001	3	10000010001000000010	3	1001010100100010010	3
1579	0000100000001001010	4	0010001001000100010	4	0100010101000010010	1	10000010001000000010	4	1001010100100010010	4
1580	0000100000001001010	5	0010001001000100010	5	0100010101000010010	2	10000010001000000010	5	1001010100100010010	5
1581	0000100000001010000	1	0010001001000100100	1	0100010101000010010	3	10000010001000000100	1	1001010100100010100	1
1582	0000100000001010000	2	0010001001000100100	2	0100010101000010010	4	10000010001000000100	2	1001010100100010100	2
1583	0000100000001010000	3	0010001001000100100	3	0100010101000010010	5	10000010001000000100	3	1001010100100010100	3
1584	0000100000001010000	4	0010001001000100100	4	0100010101000010100	1	10000010001000000100	4	1001010100100010100	4
1585	0000100000001010000	5	0010001001000100100	5	0100010101000010100	2	10000010001000000100	5	1001010100100010100	5
1586	0000100000001010001	1	0010001001000100101	1	0100010101000010100	3	10000010001000000101	1	1001010100100010101	1
1587	0000100000001010001	2	0010001001000100101	2	0100010101000010100	4	10000010001000000101	2	1001010100100010101	2
1588	0000100000001010001	3	0010001001000100101	3	0100010101000010100	5	10000010001000000101	3	1001010100100010101	3
1589	0000100000001010010	1	0010001001000101000	1	0100010101000010101	1	10000010001000001000	1	1001010100100100000	1
1590	0000100000001010010	2	0010001001000101000	2	0100010101000010101	2	10000010001000001000	2	1001010100100100000	2
1591	0000100000001010010	3	0010001001000101000	3	0100010101000010101	3	10000010001000001000	3	1001010100100100000	3
1592	0000100000001010010	4	0010001001000101000	4	0100010101000100000	1	10000010001000001000	4	1001010100100100000	4
1593	0000100000001010010	5	0010001001000101000	5	0100010101000100000	2	10000010001000001000	5	1001010100100100000	5
1594	0000100000001010100	1	0010001001000101001	1	0100010101000100000	3	10000010001000001001	1	1001010100100100001	1
1595	0000100000001010100	2	0010001001000101001	2	0100010101000100000	4	10000010001000001001	2	1001010100100100001	2
1596	0000100000001010100	3	0010001001000101001	3	0100010101000100000	5	10000010001000001001	3	1001010100100100001	3
1597	0000100000001010100	4	0010001001000101010	1	0100010101000100001	1	10000010001000001010	1	1001010100100100010	1
1598	0000100000001010100	5	0010001001000101010	2	0100010101000100001	2	10000010001000001010	2	1001010100100100010	2
1599	0000100000001010101	1	0010001001000101010	3	0100010101000100001	3	10000010001000001010	3	1001010100100100010	3
1600	0000100000001010101	2	0010001001000101010	4	0100010101000100010	1	10000010001000001010	4	1001010100100100010	4
1601	0000100000001010101	3	0010001001000101010	5	0100010101000100010	2	10000010001000001010	5	1001010100100100010	5
1602	0000100000010000001	1	0010001001001000001	1	0100010101000100010	3	10000010001000010000	1	1001010100100100100	1
1603	0000100000010000001	2	0010001001001000001	2	0100010101000100010	4	10000010001000010000	2	1001010100100100100	2
1604	0000100000010000001	3	0010001001001000001	3	0100010101000100010	5	10000010001000010000	3	1001010100100100100	3
1605	0000100000010000010	1	0010001001001000010	1	0100010101000100100	1	10000010001000010000	4	1001010100100100100	4
1606	0000100000010000010	2	0010001001001000010	2	0100010101000100100	2	10000010001000010000	5	1001010100100100100	5
1607	0000100000010000010	3	0010001001001000010	3	0100010101000100100	3	10000010001000010001	1	1001010100100100101	1
1608	0000100000010000010	4	0010001001001000010	4	0100010101000100100	4	10000010001000010001	2	1001010100100100101	2
1609	0000100000010000010	5	0010001001001000010	5	0100010101000100100	5	10000010001000010001	3	1001010100100100101	3
1610	0000100000010000100	1	0010001001001000100	1	0100010101000100101	1	10000010001000010010	1	1001010100100101000	1
1611	0000100000010000100	2	0010001001001000100	2	0100010101000100101	2	10000010001000010010	2	1001010100100101000	2
1612	0000100000010000100	3	0010001001001000100	3	0100010101000100101	3	10000010001000010010	3	1001010100100101000	3

FIG. 17C

Data	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
8144	00000100010000000000	4	00010000001000000000	3	00010101001010000000	4	10000000010000000000	4	10000010001000000000	3
8145	00000100010000000000	5	00010000001000000000	4	00010101001010000000	5	10000000010000000000	5	10000010001000000000	4
8146	00000100010010000000	2	00010000001000000000	5	00010101010000000000	3	10000000010010000000	3	10000010001000000000	5
8147	00000100010010000000	3	00010000001001000000	2	00010101010000000000	4	10000000010010000000	4	10000010001010000000	2
8148	00000100010010000000	4	00010000001001000000	3	00010101010000000000	5	10000000010010000000	5	10000010001010000000	3
8149	00000100010010000000	5	00010000001001000000	4	00010101010010000000	2	10000000010010000000	2	10000010001010000000	4
8150	00000100010100000000	2	00010000001001000000	5	00010101010010000000	3	10000000010100000000	3	10000010001010000000	5
8151	00000100010100000000	3	00010000001010000000	2	00010101010010000000	4	10000000010100000000	4	10000010010000000000	3
8152	00000100010100000000	4	00010000001010000000	3	00010101010010000000	5	10000000010100000000	5	10000010010000000000	4
8153	00000100010100000000	5	00010000001010000000	4	00010101010100000000	2	10000000010100000000	2	10000010010000000000	5
8154	00000100100000000000	4	00010000001010000000	5	00010101010100000000	3	10000000100000000000	3	10000010010010000000	2
8155	00000100100000000000	5	00010000010000000000	3	00010101010100000000	4	10000000100000000000	4	10000010010010000000	3
8156	00000100100010000000	2	00010000010000000000	4	00010101010100000000	5	10000000100010000000	5	10000010010010000000	4
8157	00000100100010000000	3	00010000010000000000	5	00100000000010000000	2	10000000100010000000	2	10000010010010000000	5
8158	00000100100010000000	4	00010000010010000000	2	00100000000010000000	3	10000000100010000000	3	10000010010100000000	2
8159	00000100100010000000	5	00010000010010000000	3	00100000000010000000	4	10000000100010000000	4	10000010010100000000	3
8160	00000100100100000000	2	00010000010010000000	4	00100000000010000000	5	10000000100100000000	5	10000010010100000000	4
8161	00000100100100000000	3	00010000010010000000	5	00100000000100000000	2	10000000100100000000	2	10000010010100000000	5
8162	00000100100100000000	4	00010000010100000000	2	00100000000100000000	3	10000000100100000000	3	10000010100000000000	4
8163	00000100100100000000	5	00010000010100000000	3	00100000000100000000	4	10000000100100000000	4	10000010100000000000	5
8164	00000100101000000000	2	00010000010100000000	4	00100000000100000000	5	10000000101000000000	5	10000010100010000000	2
8165	00000100101000000000	3	00010000010100000000	5	00100000001000000000	2	10000000101000000000	2	10000010100010000000	3
8166	00000100101000000000	4	00010000100000000000	4	00100000001000000000	3	10000000101000000000	3	10000010100010000000	4
8167	00000100101000000000	5	00010000100000000000	5	00100000001000000000	4	10000000101000000000	4	10000010100010000000	5
8168	00000100101010000000	2	00010000100010000000	2	00100000001000000000	5	10000000101010000000	5	10000010100100000000	2
8169	00000100101010000000	3	00010000100010000000	3	00100000001010000000	2	10000000101010000000	2	10000010100100000000	3
8170	00000100101010000000	4	00010000100010000000	4	00100000001010000000	3	10000000101010000000	3	10000010100100000000	4
8171	00000100101010000000	5	00010000100010000000	5	00100000001010000000	4	10000000101010000000	4	10000010100100000000	5
8172	00000101000010000000	2	00010000100100000000	2	00100000001010000000	5	10000001000010000000	5	10000010101000000000	2
8173	00000101000010000000	3	00010000100100000000	3	00100000010000000000	3	10000001000010000000	3	10000010101000000000	3
8174	00000101000010000000	4	00010000100100000000	4	00100000010000000000	4	10000001000010000000	4	10000010101000000000	4
8175	00000101000010000000	5	00010000100100000000	5	00100000010000000000	5	10000001000010000000	5	10000010101000000000	5
8176	00000101000100000000	2	00010000101000000000	2	00100000010010000000	2	10000001000100000000	2	10000010101010000000	2
8177	00000101000100000000	3	00010000101000000000	3	00100000010010000000	3	10000001000100000000	3	10000010101010000000	3
8178	00000101000100000000	4	00010000101000000000	4	00100000010010000000	4	10000001000100000000	4	10000010101010000000	4
8179	00000101000100000000	5	00010000101000000000	5	00100000010010000000	5	10000001000100000000	5	10000010101010000000	5
8180	00000101001000000000	2	00010000101010000000	2	00100000010100000000	2	10000001001000000000	2	10000100000010000000	2
8181	00000101001000000000	3	00010000101010000000	3	00100000010100000000	3	10000001001000000000	3	10000100000010000000	3
8182	00000101001000000000	4	00010000101010000000	4	00100000010100000000	4	10000001001000000000	4	10000100000010000000	4
8183	00000101001000000000	5	00010000101010000000	5	00100000010100000000	5	10000001001000000000	5	10000100000010000000	5
8184	00000101001010000000	2	00010001000010000000	2	00100000100000000000	4	10000001001010000000	4	10000100000100000000	2
8185	00000101001010000000	3	00010001000010000000	3	00100000100000000000	5	10000001001010000000	5	10000100000100000000	3
8186	00000101001010000000	4	00010001000010000000	4	00100000100010000000	2	10000001001010000000	2	10000100000100000000	4
8187	00000101001010000000	5	00010001000010000000	5	00100000100010000000	3	10000001001010000000	3	10000100000100000000	5
8188	00000101010000000000	3	00010001000100000000	2	00100000100010000000	4	10000001010000000000	4	10000100001000000000	2
8189	00000101010000000000	4	00010001000100000000	3	00100000100010000000	5	10000001010000000000	5	10000100001000000000	3
8190	00000101010000000000	5	00010001000100000000	4	00100000100100000000	2	10000001010000000000	2	10000100001000000000	4
8191	00000101010010000000	2	00010001000100000000	5	00100000100100000000	3	10000001010010000000	3	10000100001000000000	5

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COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT AND DESIGN APPLICATIONS

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

:rt Title:

METHOD AND APPARATUS FOR CODING INFORMATION, METHOD AND APPARATUS FOR DECODING INFORMATION, METHOD OF FABRICATING A RECORDING MEDIUM, THE RECORDING MEDIUM AND MODULATED SIGNAL

in Appropriate :rmation - Use Without :ification :ched:

the specification of which is attached hereto. If not attached hereto,
the specification was filed on _____ as
United States Application Number _____;
and amended on _____ (if applicable) and/or
the specification was filed on _____ as PCT
International Application Number _____; and was
amended under PCT Article 19 on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

:art Priority :rmation: :ppropriate)

Prior Foreign Application(s) — Priority Claimed

(Number)	(Country)	(Month/Day/Year Filed)	Yes	No
99203739.0	EPO	November 11, 1999	☒	☐
			☐	☐
			☐	☐
			☐	☐

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional applications(s) listed below.

:rt Provisional :plication(s): :ny)

(Application Number)	(Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

:rt Requested :rmation: :ppropriate)

Country	Application Number	Date of Filing (Month/Day/Year)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States and/or PCT application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States and/or PCT application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

:rt Prior U.S. :plication(s): :ny)

(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)

Attorney Docket No. 630-1167P

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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